The Theory of Teaching

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THE THEORY OF TEACHING AND ELEMENTARY PSYCHOLOGY

BY

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PREFACE

This treatise, if such it may be called, is professedly of a rudimentary character; it is designed for beginners in the study of educational psychology and pedagogy. Its purpose is only to lay a foundation for such study, to open up the subject and give the student the necessary tools for working the field of pedagogical thought.

For nearly twenty years, the writer has taken in hand, twice in each year, a class of pupils in the second year of the normal school course with this purpose of inducting them into the elements of pedagogical theory. Finding no text-book in existence suitable to his view of such an undertaking, he was compelled to give the instruction in an oral, "Socratic," conversational manner, using books only for occasional reference. The time has now come, as it seems to him, for reducing this work to written form, with a view to economizing the time of future pupils, and in the hope that it may serve a useful purpose to young teachers in their daily work or as members of circles for professional reading and study.

The peculiar form and arrangement given to the matter of this book are thus the outgrowth of long experience and direct contact with students as yet unused to introspection or to abstract thought. The writer, as a teacher, has sought continually to find the natural methods of approach and the natural lines of progress in the development of a pedagogical attitude of mind, without too much regard to traditional modes, and yet with a careful avoidance of eccentricity or intentional novelty. Clearness and conciseness have been a constant aim.

A fatal defect with most, if not all, text-books on psychology as yet offered to the public is found in the fact that their authors are always, unconsciously, talking to other psychologists and never to tyros. They seem uniformly unable to conceive the real condition of mind in which students in normal schools and high schools come to their first contact with any study of their own minds or the laws of mental activity; and so they proceed to submerge the young people in depths of incomprehension and bewilderment. Another fault common in works of this sort is the dryness and opacity due to dearth of adequate and pertinent illustration. The author hopes that he has been successful in avoiding these sins, whatever other mistakes he may have fallen into.

All rational pedagogy looks to psychology for its guiding principles, but not to psychology alone. The laws of mental growth are laws of teaching; but psychology rests back on physiology and leads forward into logic and ethics. A proper introduction to the principles of teaching involves, therefore, considerable familiarity with the physiology of the nervous system as a necessary preliminary to the comprehension and application of psychological laws. It also involves some acquaintance with elementary logic, a truth too often overlooked in the training of teachers. There has been no effort in this work to keep the physiology, the psychology, and the logic separate and distinct; indeed, a contrary purpose has prevailed. Whether the "blend" has been successfully effected, it remains for the reader to decide.

It has not been thought necessary to put everything into the book that ought to go into the mind of the student. Much has intentionally been left to the teacher. The several paragraphs, or sections, are rather in the nature of *texts* than of complete discourses. It is hoped

that whoever teaches the book, including leaders of reading circles, may keep this fact clearly in mind. Nor has it been thought needful to load the chapters up with bibliographies. Each teacher will be able to furnish his own, adjusted to the material which is accessible to his class.

It is believed that the book is well suited as a text-book in either theory of teaching or elementary psychology. High school classes wishing a brief course in psychology without definite reference to teaching may omit Parts I and III, using only Part II. On the other hand, prospective teachers will cover the whole book in regular order, Part III furnishing not only the pedagogical application of what precedes, but also an effective review of Part II. Pupils already well versed in psychology can omit Part II as far as Chapter XXIV. But Chapters XXIV and XXVI, on Language and General Method, should not be omitted under any circumstances.

Special acknowledgment is hereby made to Dr. J. W. Stearns, late of the University of Wisconsin, for valued service in reading the whole work in manuscript and making useful criticisms and suggestions. Similar service was rendered by my assistant in psychology, Prof. H. H. Schroeder. Acknowledgment is also made of the kindness of D. C. Heath & Co., in permitting the use of several cuts from *Colton's Briefer Physiology*, and of Ginn & Co., in allowing the use of cuts from *Blaisdell's Practical Physiology*.

A. S.

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TABLE OF CONTENTS

PART I. INTRODUCTORY

CHAPTER I

What Theory Means

CHAPTER II

Education, Its Nature and End

CHAPTER III

The Teacher's Material: Mind

PART II. ELEMENTARY PSYCHOLOGY AND LOGIC

CHAPTER IV

The Nature of Mind

CHAPTER V

How Knowledge Begins

CHAPTER VI

The Nervous Mechanism

CHAPTER VII

The Nervous Mechanism (*Continued*)

CHAPTER VIII

Reflex Action

CHAPTER IX

Sensation

CHAPTER X

The Body-Serving Senses

CHAPTER XI

The Knowledge-Giving Senses

CHAPTER XII

The Sense of Hearing

CHAPTER XIII

The Sense of Sight

CHAPTER XIV

Sense Defects

PART I

INTRODUCTORY

CHAPTER I

WHAT THEORY MEANS

As already intimated in the preface, it is the purpose of this book to serve the ends of teachers and others who desire to make an elementary but careful and systematic study of the theory of teaching and whatsoever is necessary to a clear and correct apprehension of the same. And perhaps the first step in that direction should be to get a definite conception of what is really meant, or should be meant, by the term *theory;* since the word, although in very common use, is somewhat ambiguous, well illustrating the fact that many words come to have divergent meanings, and that we need always to discern which meaning is intended in any given instance. Much confusion often arises, among teachers as well as other people, through neglect of this very important fact.

What Theory Means.—Etymologically, the word is derived from a Greek word meaning *to behold.* Thus, in its ancient use, *theoria* meant anything found out, information, knowledge of any sort; but the modern use is much more restricted. In common speech, it is often used to denote a supposition, a conjecture, more or less elaborated, and proposed as a reasonable explanation of

some obscure fact or condition of things not fully understood. Thus, if a house had been mysteriously burned with all its inmates, each witness of the result might have his own individual "theory" of how the fire originated. If, however, the fact to be accounted for were one of great importance or of scientific interest, the speculation, or tentative solution, would be called a *hypothesis*. *Hypothesis* and *supposition* are respectively the Greek and Latin words denoting one and the same idea; the word *theory* should not be confused with either of these by careful speakers.

Scientific Use of the Term.—In scientific usage, the term *theory* has acquired a meaning still farther removed from its original sense. *It stands for the whole body of principles underlying any subject or branch of knowledge.*

Principles are defined as fundamental truths. It thus becomes necessary to understand the difference between truths and facts. Fact is derived from *facere*, to make or do. A fact is something made or done, a completed event or thing. Facts are single, individual, particular. Each tick of a clock, for instance, is a fact; the clock itself is a fact. A fact has reality only at a particular time and place.

Truths, on the other hand, are general, universal. A truth is *always* true. It is a truth that all clocks tick. It is a fact that I have two eyes; it is a truth that every normally constituted man has two eyes. What we call the laws of nature are truths. Thus *law*, *truth*, and *principle* mean much the same thing.

Science is made up of truths, or principles; it is general knowledge. Hence theory and science mean much the same thing.

It seems necessary, therefore, to keep in mind the fact that theory has two divergent meanings, (1) The loose, popular meaning of supposition, hypothesis, guesswork by

way of explaining phenomena, and (2) The strict, scientific meaning of the body of principles underlying a subject.

Distinction between Hypothesis and Theory.—It is useful to note a distinction sometimes made between *theory* and *hypothesis.* While the supposition, or speculation, especially if somewhat elaborate or complex, is still mere conjecture, it is called a hypothesis. When evidence for it has accumulated so that it comes to be generally accepted as established, it is then called a theory. Thus, men once spoke of the nebular hypothesis, the evolution hypothesis, whereas we now speak of the nebular theory, the evolution theory. Thus theory in the loose, popular use, like hypothesis, is applied to tentative, conjectural explanations of events and phenomena, while in its scientific use it is applied only to the *true* and verified explanations based in the nature of things, the laws of nature and of life.

Theory and Practice.—The terms *theory* and *practice*, like *science* and *art*, are correlative terms, the one having reference to knowledge general, or universal, in its character; the other having reference to skill in the doing of things. People often assume a contradiction between theory and practice. They say, "That may be good theory, but it will not work in practice." Such a remark grows out of a misconception of terms. Nothing can be good theory which will not work out in practice. Theory is the *truth* which underlies practice, or art. We must prove a proposed theory to be false or untenable before we are entitled to say that it will not work in practice. Of course, a genuine failure to "work" under proper conditions would argue that the proposed theory was either false or not rightly understood by those attempting to apply it.

Scope of the Term Illustrated.—The full application of the term *theory* may be illustrated by reference to the construction of a great building or bridge. No amount of mere practical knowledge, or knowledge of facts, would suffice for such an undertaking. There must first be an architect or engineer with a large equipment of theoretical knowledge. This will comprise a knowledge of (1) The End, or Purpose, of the structure; (2) The Materials, including full understanding of their properties and consequent fitness; (3) The Mechanism, or the principles and forms of mechanical construction.

The intelligent practice of teaching, in like manner, involves a knowledge of the theory, or principles, of teaching in these three lines of End, Material, and Mechanism, or Method.

Why Study the Theory of Teaching?—We study the theory of teaching for the same reason that we study the theory of mechanics, namely, *that our practice may be more intelligent, safe, and economical.* Theoretical knowledge in connection with and antecedent to any art tends to prevent waste of material and waste of effort, as well as to secure more perfect results. A famous English surgeon was complimented on his skill in operations on the eye. He replied sadly, "Yes, but it has cost a whole bushel of eyes." A complete scientific equipment at the outset would doubtless have saved many of that "bushel" of eyes.

The teacher's art is so far-reaching in its effects, so remediless when misdirected, that theoretical foundations, wherever discoverable, are more essential and imperative than with any other art. "Forewarned is forearmed," and it behooves the teacher to have all possible light and guidance through knowledge of the general laws and principles which underlie his work.

Summary.—The word *theory*, in common speech, means a supposition or hypothesis; in stricter, scientific usage it means the body of fundamental truths, or principles, underlying a subject.

Truths are general, universal; facts are particular, individual.

When a hypothesis has become generally accepted, it is called a theory.

The terms *theory* and *science* are closely related, as are their correlatives, art and practice.

The theory underlying any art comprises knowledge of (1) The End, (2) Materials, and (3) Mechanism, or Method.

We study the theory of teaching, as we do that of any other art, to prevent mistakes and needless waste.

CHAPTER II

EDUCATION: ITS NATURE AND END

The Derivation of the Term.—The word *education* is derived, according to the traditional etymology, from the Latin *educere*, to draw out, or bring forth. A mistaken application of this etymology has, however, often been made. Education is not drawing out in the mechanical sense of "pumping," or seeking to elicit expression of knowledge. A helpful illustration of the true application may rather be drawn from the garden. When a seed or bulb is planted, under proper conditions, we may think of sun and rain as drawing out the plant from its germ, producing "first the blade, then the ear, then the full corn in the ear." In such a sense only is education a drawing-out process. It stimulates and, in a manner, directs the development of what is already in the germ potentially. The closest synonym for education is development.

What Development Means. — Development includes growth, but is something more than growth. While growth, physically speaking, may mean only increase of bulk or weight, development involves increase in complexity of structure and of function, with consequent increase of value or capacity. There is, however, really no such thing as mental growth without development of some sort.

Mental development implies increase of capacity in various directions. We may specify (1) Increase in capacity for *work*, efficiency, the ability to bring things to pass.

(2) For *understanding*, comprehension of the true nature and reasons of things. (3) For *enjoyment*, the power to derive satisfaction from the various elements of our environment. (4) For *usefulness*, serviceableness to those about us and to society.

These four factors of personal development more or less overlap. The efficient man commands his price in the world. His efficiency is itself a source of enjoyment and a chief means of usefulness. The man who understands derives great enjoyment from his understanding. The educated, or developed, man has more channels of enjoyment and deeper currents flowing in them. The serviceable, self-sacrificing man is such by reason of his understanding and efficiency, and derives the highest type of enjoyment from his service to mankind.

The Factors of Education.—Education includes certain factors, differing in form. The first of these is Instruction. The word is derived from *instruere*, meaning to build within. Instruction is therefore the building up, within the mind of another, of a body of organized knowledge, not mere facts heaped up like a sand-pile, but truths fitted together and forming a mental structure.

A second factor is Training. This bears the same relation to instruction that art does to science. It develops the power to do things and to apply knowledge. The end of instruction is knowledge; the end of training is skill. Skill is perfection in doing; it involves (a) *accuracy* in execution, (b) *facility*, or ease of execution, and (c) *rapidity* of execution, which is, in fact, only a consequence or accompaniment of facility. We train children in the arts, for instance, of reading, penmanship, singing, and gymnastics. We instruct them in history and the sciences.

But education includes something more than instruction and training. This additional element, unfortu-

nately, has not been clearly enough differentiated to receive a distinctive name. It is the remaining part of what produces *character*. Perhaps the term *inspiration* would serve as well as any. We may say,

$$\text{then, that Education} \begin{cases} \text{Instructs,} \\ \text{Trains,} \\ \text{Inspires.} \end{cases}$$

In the case of savage or primitive peoples, education consists chiefly of training, that factor being magnified to meet the end of self-preservation and the demands of the tribe, or social unit, including the forms of religious ceremonial. This training is often rigorous and admirably suited to the conditions which it is designed to perpetuate, as in the case of the Zunis and other Pueblo Indians. European education, in the past, has laid its greatest stress on instruction, aiming to produce the scholar or learned man rather than the efficient member of society.

THE END OF EDUCATION

As the architect must first know the end, or purpose, of the building which he is set to construct, before his professional knowledge and skill can be brought into successful play, so the educator must have a well defined conception of the end at which education aims, the result which it should strive to produce in those subjected to its processes. Otherwise, its course will be capricious and haphazard and constantly liable to wasteful misdirection. And it must be remembered that the child has but one chance at education; if that chance is missed or wasted, the loss and damage are eternal.

Statements of the End of Education.—The end of education has been stated in many ways, which differ more, perhaps, in their phraseology than in their real signification. Probably the most familiar is the one attributed to

Rousseau and endorsed by Herbert Spencer, viz., *The end of education is complete living.* This is a very concise formula, and helpful if one understands what is really involved in living completely. In forming an idea of the contrast between a complete life and a narrow, fragmentary one, we may be helped by comparing the actual mental life and soul-experience of some uneducated, neglected, and spiritually stunted person of our acquaintance with our idea of his original, native possibilities, intellectual and moral, under a favorable regimen, or environment.

Another formula favored by many philosophers makes the end of education to be *self-realization*, the fulfillment of one's destiny, the attainment of one's highest possibilities as a human being. Thus Plato held that education should "give to the body and to the soul all the beauty and all the perfection of which they are capable."

A more recent statement of the end, derived from the German philosopher Herbart and now widely popularized, is that of "character building," which becomes really significant only when we arrive at a satisfactory definition of what is meant by character.

Of these three formulæ, so nearly equivalent in meaning, perhaps the most satisfactory and self-explanatory is that of self-realization. Under it, education is viewed as a process of gradual unfoldment, the opening out of all the soul's powers, as the perfect flower with all its organs is unfolded from the tiny bud, or even as the oak from the acorn.

Other Statements of the End.—Other statements of the aim or ideal have been proposed which lay less emphasis on the development of the individual as such and more on his preparation for life as a member of human society. Among the best of these, is that offered by Thomas David-

son, to wit: "The aim of education is the evolution of a social individual in intelligence, sympathy, and will." This involves the thought that man is not educated "to himself alone," but in order that he may play a fit and useful part among his fellow men.

A similar conception of education now commanding attention is that its function is that of "adjustment to environment," a phrase somewhat vague and perhaps too elastic and indefinite to afford, as yet, much practical guidance. Education aims at far more than adjustment to any environment, since man to so great a degree creates his own environment.

Mental Symmetry as an End.—Along with the conception of the educational aim as "complete living," it has been much the custom to couple the idea of symmetrical, balanced culture. As in physical education we strive to develop and strengthen the weak and undeveloped muscles and organs so that the system shall be normal and vigorous, so in the education of the soul we should strive to rescue it from one-sidedness and abnormality. The developing of all our mental powers into perfect balance, to the end of well-rounded character and the ability to participate in all right and wholesome human experiences, is, to say the least, an inspiring aim in education.

We may add here for thoughtful consideration the declaration of John Milton, that a complete education should fit a man "to perform justly, skillfully, and magnanimously all the offices both private and public of peace and war."

The Objects of a School.—The school is one of the means devised for accomplishing the ends of education—a means only. The objects of a school may be briefly stated as

(1) To promote the right development of the pupil.

(2) To impart useful knowledge.

The acquisition of knowledge is an indispensable means in the process of education. There can be no mental development without the exercise of the knowing powers; knowledge has been called "the aliment of the mind." Yet knowledge is not a complete and sufficient end in itself. Contrary to the popular conception, we must place its acquisition as, at most, only the secondary object of school endeavor. The question may further arise as to what knowledge really is useful. And here we must not think only of the material interests of men. That knowledge is most useful, most practical, which helps best to secure the true ends of education, which tends to enlarge and enrich the soul-life of the individual, to multiply his interests, and to make him of worth to the community to which he belongs. The writer of this book is fond of stating the end of education, and consequently the object of the school, as *increase in personal value.* Education makes one truly man, and increases the significance of his life, both to himself and to the world.

Summary.—Education is a drawing-out process only in the same sense as is the growth of a plant. Its closest synonym is development.

Development implies increase of capacity for work, understanding, enjoyment, and service.

Education includes instruction, training, and an additional factor which may be called inspiration.

Training aims at skill, which involves accuracy, facility, and rapidity of execution.

The end of education has been variously stated as complete living, self-realization, character building, increase of personal value, and the evolution of a social individual. The conception of mental symmetry as an end in education has also had much influence.

The objects of a school are primarily, the mental development of the pupil, and, secondarily, the impartation of useful knowledge.

CHAPTER III

THE TEACHER'S MATERIAL: MIND

The Teacher Must Know his Material.—The engineer must be duly advised of the end, or purpose, of the structure which he is commissioned to construct; but he is no engineer if he has not already been made thoroughly conversant with the general properties and nature of all the materials from which he will have to make selection for his purpose. He must know scientifically, or theoretically, the forms of matter which are available. Any ignorance of which he may be guilty, any mistake which he may make here, will appear against him in due time in the form of disaster, ruin, or decay.

The teacher, as an architect of character, is no less under the necessity of knowing the material of his art, not empirically and superficially but scientifically, in order that his work may stand the tests of life and time. But his case differs from that of the engineer in that he has no choice of materials; the one material on which he must work is Mind, *child* mind. And this he must take as it comes to him; he has no choice of quarry and no control over the quarrying.

Peculiarity of the Teacher's Material.—There is yet a further difference between the engineer and teacher in that the one works with dead material, unchangeable except by external attack; while the teacher's material is a living thing, immaterial, a spiritual organism, yet mysteriously connected with a material body, also a living

organism. This twofold, plastic, living material is therefore marvelously more complex, delicate, and susceptible of irreparable damage than all the materials of the builder's art, and correspondingly more difficult of intelligent comprehension. Of all those who "rush in where angels fear to tread," the foremost in presumption would seem to be those who cheerfully essay the work of teaching without any theoretical knowledge of this living material which they hope permanently to transform.

What the Teacher Needs to Know.—Every teacher must make a special study of the peculiarities and limitations of the individual minds entrusted to his care. But this study of individual traits, in order to be intelligent and trustworthy, must be made in the light of an adequate acquaintance with the general truths, or laws, of mind. And this adequate acquaintance does not come by intuition nor by mere cursory observation of the actions of children. It is needful, therefore, that the prospective teacher make a somewhat careful, even though elementary, study of the laws of mind as formulated and arranged by the science of Psychology.

But as the teacher's material is not pure and unrelated mind, so it is not enough that he should know, as a preparation for his work, pure and unrelated psychology. To use a crude figure, Pedagogy walks on at least four feet, and psychology is only one of these. That "the proper study of mankind is man" is truer for the teacher than for anybody else; but "man" is a complex, the successful study of which demands the aid of Physiology, Logic, and Ethics, as well as Psychology. And the teacher's knowledge of these sciences of man must not be kept in so many separate compartments, or pigeon-holes. It is perhaps a defect of present-day instruction that we separate the sciences too strictly in our teaching. In the follow-

ing chapters they will be drawn upon somewhat indiscriminately as occasion and mutual helpfulness require, without much regard to division lines. It will be the steady aim in Part II to set forth as clearly and simply as possible the nature of mind and its typical modes of action, assuming that the reader is not entirely ignorant of Physiology, and especially Neurology, the physiology of the nervous system. Part III will deal with the practical application of the knowledge presented in Part II to the work of teaching. As Part I deals with the End of Teaching, Parts II and III, respectively, will deal with the Material and the Mechanism of the teacher's art.

Summary.—As the engineer or architect must have large theoretical knowledge of his materials, so the teacher must know, scientifically, the material of his art, that his work may stand.

The material which the teacher must fashion is mind, a living, spiritual organism, complex, delicate, and susceptible of permanent damage.

The teacher must study the peculiarities and limitations of each individual pupil, but this must be done in the light of the general truths, or laws, of mind and life. This will involve some acquaintance with Physiology, Psychology, Logic, and Ethics, these being the four sciences on which scientific pedagogy rests.

PART II

ELEMENTARY PSYCHOLOGY AND LOGIC

CHAPTER IV

THE NATURE OF MIND

What is Mind?—We may not aspire, at this point, to frame a scientific definition of mind; but we may clear up our notion of it somewhat by other means. A synonym is not a definition, we should remember; yet synonyms often help us to clearer understanding. Some synonyms, then, for mind are *soul*, *spirit*, *the ego*, *the self*, the *immaterial* part of man. Mind and soul are, in scientific usage, synonymous; though in religious parlance the word soul is used to denote a particular aspect or activity of the mind as if it were a distinct entity, or substance. We assume a distinction, a separateness of nature, between mind and matter; but we know nothing, in fact, of the ultimate nature of either in itself. We know them both only through their manifestations, their observable phenomena. The question of what mind *is* in itself belongs to philosophy rather than to psychology or pedagogy. The question for us, then, is "How does mind act, what can it do?" And the same is true as to matter.

What Matter and Mind Do.—What does matter do? Only one thing: it moves. We are to think here not of gross movements simply, like those of falling bodies, but

more especially of molecular motion, those infinitesimal and invisible movements with which it is the business of Physics to deal. Matter *vibrates.*

What can mind do? Three things. It is not ponderable; it does not occupy space; size does not pertain to it. But it is capable of changing its own condition in three modes, or forms. Mind *knows*, *feels*, and *wills.*

Knowing, Feeling, and Willing.—It is not easy to draw a line between these activities, or to formulate definitions. The soul does not act one side at a time, but as a whole. Every state of the mind is a compound of knowing, feeling, and willing; and we name the state from its predominating element. Yet we are better able to think and talk about the mind by distinguishing these different phases of its activity.

(1) In lack of satisfactory definitions, we may say, roughly, that Feeling includes those activities of mind which are accompanied by some degree of *pleasure* or *pain.* The question has been discussed whether there are any feelings devoid of either pleasure or pain. But it seems natural to regard "neutral" feelings as only those in which there is a very low degree of pleasure or pain. These terms, pleasure and pain, express the *value* or *interest* which a given mental state has for us.

(2) Knowing is the term applied to the consciousness of *difference* or *resemblance* between our mental experiences, and so, by assumption, between the external objects which in any way affect our mental states. The two fundamental operations of Knowing, or Intellect, are (1) Discrimination, or the discernment of difference; and (2) Assimilation (from *similis*, like), the discernment of likeness. We shall have further occasion, later on, to consider these fundamental intellectual activities.

(3) Will is a term of somewhat various application, but

is always applied to those phases of mental activity connected with *action*, or the inception of action. Will, in the narrower sense of the word, has been defined as "the soul's power of self-direction towards chosen ends."

Consciousness.—Consciousness is a very convenient term, which covers all mental operations. Knowing, feeling, and willing are all forms or elements of consciousness. When neither pleasure, pain, discrimination, nor tendency to self-directed action are present, we call the condition unconsciousness. The individual consciousness is very complex, composed of many elements, and continually changing, so that we speak, appropriately, of the *stream of consciousness.* This stream is broken, or interrupted, only by sleep, and by abnormal brain conditions, such as fainting fits.

Connection of Mind and Body.—In common thought and speech, we distinguish between mind and body. We speak of the body as "the casket of the soul," "the temple of the spirit," or as the "servant" of the mind. But while recognizing the truth which underlies these expressions, we should not overlook the converse relation, the dependence of the mind on the body. As we shall see in the chapters following, mental activity cannot begin nor develop except through changes in the condition of the nervous system. Our states of mind depend on the changing conditions and states of the body. Mental vigor is more or less dependent on bodily vigor. Mental derangement is traceable to brain disorder, or injuries. The various emotions, as fear, anger, and joy, find their expression in bodily signs; and the energy of our bodily acts depends on the energy of our acts of will. The body is not simply an intermediary between the mind and the external world; there is a close and wonderful interdependence between them. The physician needs to know

something of the laws of mind in order to treat properly the disorders of the body; and the teacher needs a considerable knowledge of physiology, especially of the nervous system, that he may deal with the mind intelligently. In the work that follows, we must distinguish clearly at all times between mind and brain, not confusing or interchanging them; but, on the other hand, we must recognize the invariable connection of brain activity and mental activity.

Psychology.—Psychology is the *science of consciousness.* Its business is to describe, classify, and explain the various states and changes of consciousness. As a science, it is still incomplete, and many of its hypotheses are yet matters of speculation and controversy. Hence its full contribution to the science of teaching has not yet been made; but much has been made out so clearly and established so firmly that the educator need not hesitate to appropriate it for guidance in his work. It is only these established propositions of psychology which directly concern the student in a normal school. The unsolved problems and unverified hypotheses of inchoate science belong only to the university and the specialist. Science deals only with observable facts and phenomena. Whatever is back of these facts and beyond the possibility of observation must be left to philosophy, or metaphysics. Philosophy may concern itself with questions as to the spiritual entity back of our mental activities, *that which* knows, feels, and wills; but psychology, as a science, must confine itself to these activities themselves. Philosophy may deal with the *thinker;* psychology deals with the *thinking.*

Summary.—Some synonyms for mind are soul, spirit, the ego, the self, the immaterial part of man.

We know nothing of the ultimate nature of either mind or matter, but know them only through their manifestations.

Matter can do only one thing; it moves, or vibrates.

Mind has three phases of activity, feeling, knowing, and willing.

Feeling is characterized by some degree of pleasure or pain.

Knowing is the consciousness of difference or resemblance.

Willing is connected with action or tendencies to action.

Consciousness is a general term for all possible mental states; it is very complex and continually changing.

While we distinguish between mind and body, we must recognize their close relation and constant interdependence and the invariable connection of brain activity and mental activity.

Psychology is the science of consciousness; it deals only with the observable manifestations of mind. Questions as to the ultimate nature of the soul, and matter as well, belong to philosophy, or metaphysics.

CHAPTER V

HOW KNOWLEDGE BEGINS

Whether the acquisition of knowledge be considered a primary or a secondary end in education, the question of the *genesis* of knowledge, its beginning and sources, is one of importance to the educator. Let us, therefore, give some consideration to the mental status of early infancy.

Mental Status of the New-Born Babe.—What does a new-born baby know? Nothing whatever. He is able to perform certain necessary actions without any process of learning how. He breathes, cries, suckles, swallows, clutches, and performs certain crude movements of the limbs without any purpose, or intention—and probably without any definite consciousness, even, of what is taking place among his members. These spontaneous, impulsive movements of legs and arms, wholly beyond the child's control, are of the utmost importance to his development, both physical and mental, furnishing the starting point and preparation by which voluntary, intentional movements become possible later on. But they must not be interpreted as furnishing any evidence of mentality at the first outset of life.

The Helplessness of Infancy.—It will be useful at this point to give a little consideration to the significance of the *helplessness* of infancy. The young of the lower animals are born ready-made, so to speak. The progeny of insects, for instance, or even of some reptiles and birds, can do soon after birth almost all that they can ever do in

the way of supplying their needs. But the human infant is long dependent on the careful service of its parents. It is physically weak and undeveloped; it has, as yet, no knowledge of the world without; it is comparatively bare of instincts, and has nearly everything to learn.

But in this fact that the child is born half-made, helpless, and dependent, lies the whole possibility of education. It is this which makes him an educable, adaptable being. The lower animal is born already adjusted to his environment; if not, he dies promptly. The human infant, which must adjust itself to a very complex environment, and to many environments, has for that reason a long period of gradual development under nurture and discipline.

The First Consciousness.—To return to our new-born babe in the cradle, we have here a little machine, wound up to execute those few movements which are most necessary to his infantile existence and out of which his future powers of action may, under favoring conditions, be evolved. What, then, is the first consciousness of the child? What is the first step out from the mental blankness immediately succeeding birth? It seems to be well established that none of the senses are active in the first day or two of life. The babe does not see, though his eyes are open. Several days may pass before any indications can be detected of sensitiveness to light; and mere sensitiveness to light can hardly be called seeing. He does not hear, and is not awakened by noise, being sensitive to jarring sooner than to sounds.

Which is the first of the senses to awaken? is a question which has received considerable attention. Dr. Preyer, a pioneer investigator, in his very interesting book on "The Senses and the Will," holds that *taste* is first to manifest its active presence; but later observers have not confirmed his conclusion. It is doubtless true that the first con-

sciousness of the child is feeling of too vague and undifferentiated a character to be assigned to any one of the special senses. It is probably an all-overish feeling of discomfort, or uneasiness, which only gradually and slowly becomes definite and specific. If a pin pricks the babe he does not know what ails him, does not know that he is pricked, still less where. It may be weeks, even, before he sees or hears in any proper sense of those terms. The sense of smell is apparently the last to come into play.

The First Intellectual Activity.—The first consciousness which can be thought of as *knowing* must consist simply in the discernment of difference, or change, in feeling. When a light comes into the room or the clock begins to strike, the babe might say, if he had the language to say anything, "That is different." Knowledge can go no farther at this stage. But after the same event has occurred a number of times, its recurrence will be recognized and the babe might be imagined to say, "There it is again." Here, then, in this earliest discrimination or detection of change, is to be found the beginning of knowledge. The means by which this power of discrimination is developed and knowledge is increased must receive fuller consideration hereafter.

The Sources of Knowledge.—The original sources of knowledge are two, (1) Perception, and (2) Self-consciousness. Perception may here be provisionally defined as the power and the act of gaining knowledge of external objects by means of the senses. It has sometimes been asserted that this is the sole source of knowledge. "*Nihil est in intellectu quod non prius fuerit in sensu*, there is nothing in the intellect which was not first in the senses," is a maxim enunciated by Comenius 250 years ago, and often reiterated since; but it can be true only in a very limited

sense. For instance, how can knowledge of the higher mathematics ever have been "in the senses"? Much of our most important knowledge is reached through reasoning and reflection. It is only the original data of knowledge of which the maxim can be held true; but, properly qualified, it is one which the teacher needs to keep steadily in view.

Self-Consciousness as a Source of Knowledge.—Self-consciousness is also a primary source of knowledge. By this is here meant the consciousness which we have of our own inner states, our emotional and intellectual conditions. This has been sometimes denominated as *inner perception;* but that only leads to confusion of thought, through looseness in the use of the term perception. How does one know that he is, at a given moment, sad or joyous, angry, or frightened, or fond? Certainly not by any means which can properly be called perception. How is one sure of his personal identity from day to day, notwithstanding the intervals of sleep? Certainly not by looking in the mirror.

This consciousness of one's self as a continuous personality and as separated from the objective world, external to self, is tardy in arising and slow of growth. Tennyson seems to have divined the truth of this matter in the well-known lines from "In Memoriam":

"The baby new to earth and sky
    What time his tender palm is prest
    Against the circle of the breast
Has never thought that this is I;

"But as he grows he gathers much
    And learns the use of 'I' and 'me'
    And finds I am not what I see
And other than the things I touch.

"So rounds he to a separate mind
From whence clear memory may begin,
As through the frame that binds him in
His isolation grows defined."

Summary.—The new-born babe *knows* nothing, but performs certain necessary actions automatically.

His first consciousness is doubtless a vague, indefinite feeling of discomfort, or uneasiness. The senses of sight and hearing are not awake in the first day or two of life.

The first beginning of knowledge is found in the consciousness of difference, or change, in states of feeling.

The young of insects and lower animals are born ready-made, but the human infant experiences a long period of incompleteness and helplessness, which is the ground of his adaptability and capacity for education.

The original sources of knowledge are two, perception and self-consciousness. These furnish the original data from which other knowledge is elaborated.

CHAPTER VI

THE NERVOUS MECHANISM

Sensation the Starting Point of Consciousness —The simplest forms of consciousness, taken collectively, go by the name of Sensation. Common speech as well as scientific thought recognizes sensation as the starting point and foundation of all mental experience. In itself, sensation is simple feeling, feeling having an external, physical origin; but it also furnishes the starting point for knowledge. It has a cognitive aspect. It is needful, therefore, to give some consideration to the physical antecedents of sensation, which are found in the functional processes of the nervous system.

The Physical Basis of Sensation.—The physical basis of sensation is found in the irritability and conductivity of certain tissues of the body known as nerve tissues and organized into an apparatus known as the Nervous System. There are in fact two of these systems, but we are here chiefly interested in that known as the Cerebro-spinal system. With the so-called Sympathetic system we need not here concern ourselves, however important it may be in the vital economy.

Nerve tissue is of two kinds, the so-called *white* and *gray* matter, the nature and relation of which will be touched upon later. The principal parts of the cerebro-spinal system are the brain, the spinal cord, and the nerves, which last radiate in pairs from the spinal cord at different levels, or from the lower parts of the brain, as in the case of the cranial nerves.

The Brain.—We may speak first, in a general way, of the brain, which is the mass of nerve tissue, along with connective and other tissues, occupying the whole inner space of the skull. It is the most highly organized and complex part of the body, and the most completely removed from direct observation. It comprises several

FIG. 1. VERTICAL SECTION OF THE BRAIN.

A, frontal lobe of the cerebrum; B, parietal lobe; D, occipital lobe; E, cerebellum; H, pons Varolii; K, medulla oblongata. The white curved band above H is the corpus callosum. (*From Blaisdell's Physiology.*)

distinct but closely related parts, or organs. These are (1) The Cerebrum, or cerebral hemispheres, occupying the upper and forward part of the cranial cavity. The two hemispheres are separated by a deep furrow, or suture, but are connected by a large band of transverse white fibers, known as the *corpus callosum.* The outer layer of the cerebrum, composed of gray matter, is called the cortex, or cortical layer, and contains the active elements of the brain, the cell bodies of the cerebral neurones. The

cortex is grooved and wrinkled with many furrows and folds, called convolutions, which give it a large exterior surface. The central part of the hemispheres is filled with the white matter, an interlacing mass of the so-called *association fibers*, which connect all parts of the cortex with other parts.

(2) Below and back of the cerebrum is the Cerebellum, or "little brain," which is supposed to have as its function the control of coördinated muscular movements, as in walking.

(3) Next to this, is the Medulla Oblongata, or Bulb, a knob-like body forming the upper terminus of the spinal cord. It connects the spinal cord with the brain and is the great railway junction, so to speak, of the nervous system. It also contains many centers of reflex action, both of the cranial nerves and of the sympathetic system, thus controlling the automatic movements of the vital organs.

(4) Other smaller bodies, such as the pons Varolii, optic thalami, corpora striata, and corpora quadrigemina, whose functions are more or less conjectural, are packed away under the base of the cerebrum and about the medulla. The brain, thus composed, is the great central organ of the nervous system, with which all parts of the body are connected by the spinal cord and the nerves.

Nerves.—The term "nerve" is somewhat indefinite, or ambiguous, in its present use. It is sometimes used as synonymous with nerve trunk, and sometimes with nerve fiber. In its simplest type, or plan, a nerve consists of a fine thread, or filament, of the gray matter, known as the *axis cylinder*, and connected at one end with a nerve cell from which it originates. This axis cylinder, or nerve fiber, is, in most cases, encased for the greater part of its length by a sheath composed of a white, fatty substance

and known as the medullary sheath. This, again, is surrounded by a delicate membranous case called the neurilemma, or epineurium. The purpose of this double sheath is supposed to be partly for protection to the enclosed fiber and partly for insulation, to prevent waste of nervous energy and confusion of nerve currents, in a manner analogous to the insulation of telephone and electric light wires. Not all nerve fibers, however, acquire the medullary sheath. Those which do are called medullated fibers and constitute what is called the white matter of the spinal cord and the brain. The so-called gray matter consists of cell bodies and non-medullated fibers. Strictly speaking, the white matter has no conductile function except as it is threaded by the gray matter of the axis cylinders.

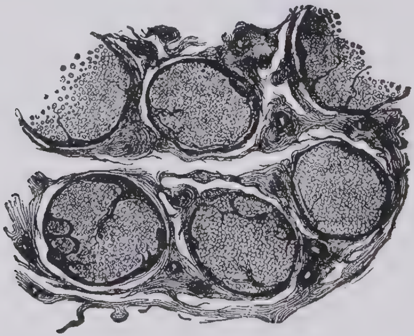


FIG. 2. CROSS SECTION OF PART OF THE MEDIAN NERVE.

Nerve trunks, also called nerves, are bundles of these nerve fibers, which divide or branch into smaller and smaller bundles as they recede from the brain or spinal cord toward the peripheral regions of the body. Each nerve trunk, whether the main trunk or a branch thereof, has its own encasing sheath and is subdivided by thin

walls of connective tissue which separate the smaller bundles. Thirty-one pairs of these nerve trunks, or nerves, depart from the spinal cord at various levels, and twelve pairs of cranial nerves branch off from the lower parts of the brain.

The Spinal Cord.—The spinal cord is a column of nervous and other tissues occupying the spinal canal, or tube which perforates the vertebræ. In the adult, its average length is about eighteen inches and its diameter about three-fourths of an inch. It terminates in a sort of whisk or bunch of nerve roots, known as the *cauda equina*, or "horse's tail." The cord is the great nerve trunk of the system, and contains a vast number of nerve fibers, both motor and sensory, with many nerve cells, all these being closely packed with connective tissue and other substances. All the nerve fibers of the thirty-one pairs of spinal nerves conduct upward by various connections to the brain. The spinal cord is thus the great, main highway by which communication is maintained between the cortex and the remotest parts of the torso and limbs of the body.

Summary.—The starting point of consciousness is found in sensation, which has its physical basis in the irritability and conductivity of nerve tissues organized in the cerebro-spinal system.

The chief organ in this system is the brain, which comprises the cerebrum, the cerebellum, and the medulla.

The cerebrum is composed of two hemispheres, complementary to each other; its outer rind or layer of gray matter is called the cortex and contains the active elements of the brain, the cerebral neurones.

The cerebellum has for its function the regulation and coordination of muscular movements. The medulla controls the automatic actions of the vital organs.

Nerves are the conducting organs of the system; they are composed of fine filaments, or fibers, called axis cylinders, each surrounded, in most cases, by a white sheath. Each nerve, or nerve

trunk, is a bundle composed of smaller bundles of nerve fibers and branching or dividing as it recedes from the spinal axis.

The spinal cord is a column of nerve tissues within the vertebral canal; from it thirty-one pairs of nerves branch off and ramify to all parts of the body. It contains large numbers of nerve cells and their connecting fibers, forming the great nervous pathway between the brain and the remoter parts of the body and comprising the centers of reflex action.

CHAPTER VII

THE NERVOUS MECHANISM—*CONTINUED*

Elements of the Nervous Mechanism.—As a working apparatus, the nervous system may be analyzed into three kinds of structures or organs, viz., Nerve Centers, Nerves, and Nerve Ends, or End Organs. The nerve fibers, whose structure has already been considered, are organs of transmission, connecting the nerve ends with nerve centers. They are of two kinds, (1) Sensory, or incarrying, nerves, which transmit energy from the nerve ends to the centers, and (2) Motor nerves, which extend from the nerve centers into all the muscles. In their transmission of nerve energy, the sensory nerves may be thought of as centripetal; the motor nerves, as centrifugal.

We must pass now to consider the source of that nerve energy for whose transmission the nerves exist.

Nerve Centers.—Nerve centers are groups, or masses, of nerve cells and fibers which form a meeting point for sensory and motor nerves. The functions of nerve centers are (1) the *generation*, (2) the *storing up*, and (3) the *discharge* of nervous energy. They might be compared, roughly, with the batteries of a telegraph system, the nerves corresponding to the wires, with this difference, that a telegraph wire conducts force in either direction, while a nerve conducts it in one direction only. Nervous energy has sometimes been thought to be identical with electricity, which it much resembles in some of its manifestations; but it is found only in connection with nervous tissues.

The brain may be considered as a great aggregation of nerve centers variously related and connected with one another, as well as with the remoter parts of the nervous system. The nerve centers of the cerebrum are spoken of as the *higher centers.* Other centers, or ganglia, as they are sometimes called, are found at the base of the brain and along the spinal cord. These are called the *lower centers.* These lower centers differ somewhat in function from those in the cerebrum, a difference which will be considered in the next chapter.

To repeat, it is the business of all nerve centers to generate and store up energy ready for discharge upon the motor nerves at the proper signal from the sensory nerves. We must now consider the nature of that signal.

Nerve Ends.—The nerve ends of the sensory nerves are distributed throughout the outer or peripheral parts of the body, including the linings of the digestive and other cavities. They are very minute in size and various in form, but may be crudely thought of as terminal expansions not unlike the leaves of a tree or the head of a pin. The immense number of nerve ends lodged in the skin vary greatly in form and special function, and some of them, as the Pacinian corpuscles, are exceedingly complex in structure. The general function of all these end organs is (1) that of *irritability*, the reception of irritation, or response to stimuli, and (2) the communication of this irritation or excitement to the nerves, by which it is transmitted, or propagated, along the nerve fibers to the nerve center. In the case of some of the cranial nerves, all the nerve ends of all the separate nerve filaments are gathered up and organized into a sense organ, as the eye and the ear.

The Stimulation of Nerve Ends.—The physical stimuli capable of exciting nerve action are various in nature, and the nerve ends are of various structure and susceptibility,

to correspond with the several forms of stimuli. Thus the nerve ends in the eye, which respond only to light-waves, and those of the ear, which respond only to sound-waves, are very different from those in the skin, which respond, according to their respective natures, to changes of contact or of temperature. But, whatever the form or kind of stimulus, the resulting excitement or "current" is doubtless some form of molecular motion or vibration which is communicated successively to the molecules of the nerve fiber, something as in the case of a row of bricks set upon end at intervals, or a row of suspended balls, when force is applied to one end of the row. Each ball or brick communicates its motion to the next, and a wave of change runs down the line.

The Discharge of Nerve Centers.—The relation of nerve centers to the rest of the mechanism may be illustrated by comparison with the process of blasting with gunpowder. The potential energy of the nerve center corresponds to the charge of powder, the nerve corresponds to the fuse, and the nerve end to a match-head attached to the end of the fuse. Scratch the match-head and the ignition causes a sputter of combustion to pass along the fuse and discharge the blast—only the rate of transmission is infinitely more rapid in the nerve fibers.

The entrance of this molecular wave, or excitation, into the nerve center has the effect, if sufficient in strength, of discharging some of its stored up energy, which gives rise to another wave, or excitation, in the motor nerves connected with that center. This motor current, upon reaching its destination, in some muscle, produces contraction of muscular fibers, and a bodily movement results. The precise character of the end-plates of the motor nerves and the method by which they excite the contractility of the muscular fibers are, as yet, rather obscure.

Neurones. — Having taken this general view of the nervous mechanism, it will be useful to go a little more minutely into the details of nerve structure, a step which we are now better prepared to take.

The unitary elements of both the higher and lower centers are known as *neurones.* A neurone consists, primarily, of a cell body composed of a granular substance called protoplasm, enclosing a small, clearer portion known as the nucleus. These cell bodies are very irregular and various in form, those of the brain being largely of the form known as pyramidal cells. They have each a number of processes, or projections, which are the starting points of fibers or filaments of various lengths.

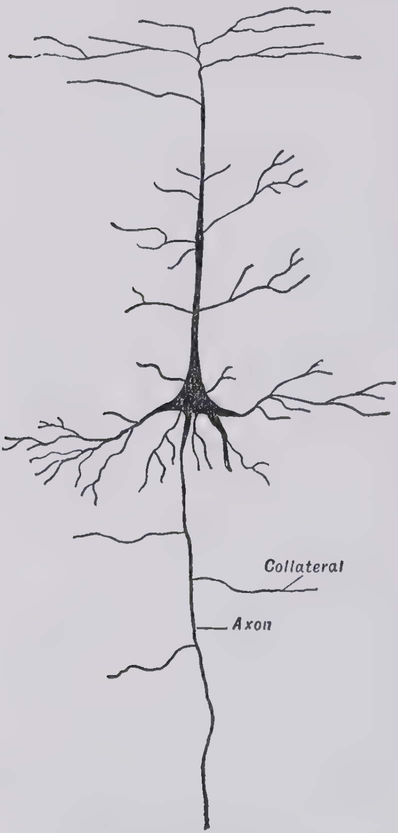


Fig. 3. Pyramidal Cell of Human Cerebral Cortex.

These are of two kinds, (1) the *axone,* a fiber having the quality of conductivity and becoming what we have called the axis cylinder of a simple nerve, or nerve fiber; (2) the *dendrons,* which divide

into finer branches or rootlets, called *dendrites.* Their functions are somewhat uncertain, including possibly that of nutrition in the service of the cell body, but probably that of conductivity also.

Axones.—The axones have a branching structure and vary greatly in length, from a fraction of an inch up to two or three feet, according to location and use. They often branch greatly, throwing off side branches called laterals, which branch again in turn. They usually terminate in little tufts resembling the fingers of a hand, or the rootlets of a plant, and known as the *arborization* of the axone. The arborization of one axone may, in appearance, clasp or encompass the cell body of another neurone, or the arborization of one axone may interlace with the dendrites of another, and thus effect communication with it by a process thought to be similar to that of electrical induction. The arborized connections between neurones are numerous in the spinal cord and medulla, and seem to obviate the necessity for axones of greater length, while furnishing a greater diversity of paths between various parts of the brain and the outlying members of the body. Neurones are anatomically separate, do not penetrate one another, but communicate

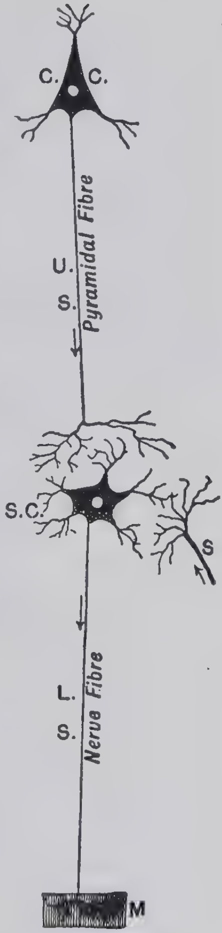


FIG. 4. DIAGRAM OF AN ELEMENT OF THE MOTOR PATH.

C. C., cell of cerebral cortex. S. C., cell of spinal cord. M., the muscle. S., path from sensory nerve roots.

force something like a row of men clasping hands with one another.

The cortical layer of the brain is largely composed of cell bodies, from which axones extend inwardly in all directions. The axones of the motor cells descend to various levels in the spinal cord, where they arborize with neurones whose axones pass out in the nerve trunks which depart from the spinal column.

Cell bodies in the lower spinal ganglia, for example, have sensory fibers which extend to the extremities, as the toes, and bring up impulses from the nerve ends of

Fig. 5. Principal Types of Cells in the Cerebral Cortex.

A, medium-sized pyramidal cell of the second layer. B, large pyramidal cell of the third layer. C, polymorphous cell of the fourth layer. D, cell of which the axone is ascending. E, neuroglia cell. G, sensory fiber from the white matter. H, white matter.

those members, while other fibers or branches extend upwards to the medulla, where they arborize with neurones whose axones reach the cortex. Such a cell might be compared, crudely, to a little man, or gnome, reaching down with one long arm to gather impulses while the other arm reaches up to clasp hands with a second man farther up the line, and thus pass along the grip received by the hand below. The cells of the cortex, on their part, have axones extending downwards to the lumbar enlargement of the spinal cord and then arborizing with neurones whose fibers pass out in the spinal nerve trunks to the remoter parts of the body.

Summary.—The nervous mechanism includes nerve centers, nerves, and nerve ends.

Nerve centers are groups of nerve cells whose function is to generate, store up, and discharge nervous energy.

The brain is an aggregation of nerve centers known as the higher centers, the lower centers being found in the medulla and spinal cord.

Nerve ends are terminal expansions or modifications of nerve fibers whose function is irritability under external stimulus. Different forms of nerve ends respond to special forms of stimulus, as different rates of vibration.

The nerves are organs of transmission between the nerve ends and nerve centers. The discharge of nerve centers excites currents in the motor nerves which result in muscular contractions.

The unitary elements of the nervous system are called neurones, and consist of a cell body, from which proceed branching fibers known as axones and dendrons. These fibers terminate in clusters of rootlets known as arborizations, which form the immediate means of communication between neurones.

CHAPTER VIII

REFLEX ACTION

The Nerve Circuit.—We are now prepared to understand, measurably, the movements of the new-born babe, as touched upon in Chapter V. In the last paragraph (Chapter VII) we have made an introductory acquaintance with what is known as the Nervous Arc, or nerve circuit, or, in other words, the full course of the nervous current excited by an external stimulation. The nerve end is excited by some vibratory or chemical stimulus; a vibration or change of some sort is propagated along the sensory nerve; a nerve center is discharged; a current is thus sent down the motor nerve to some muscle, and motion results.

Reflex Action.—By a not altogether happy figure of speech, the motor current, in certain cases, is represented as thrown back, or reflected, from the nerve center, and the resulting movement is called Reflex Action. This term is usually applied, however, only to those cases in which the movement is effected by the discharge of one or more of the lower centers, the cerebrum not being necessarily involved. Many experiments showing this independence of cerebral control in reflex movement have been made in laboratories by the use of frogs and other animals of low order. The cerebral hemispheres are removed and the frog suspended by his lip. If then a brush or pencil be dipped in strong acid and touched to his side, causing an irritation, the foot on that

side will be raised to scratch away the irritant. If the foot be restrained by any means, the other foot will then attempt to remove the offending agent. If the body of a milliped or "thousand-legged worm" be cut in segments, each segment will continue to travel for a time, till its vitality is exhausted. The brains of pigeons may be removed, and the birds will still respond to proper stimulation with appropriate movements, all void of intelligence.

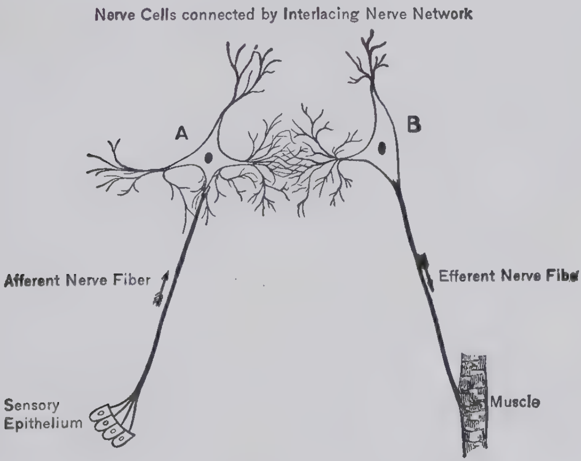


FIG. 6. DIAGRAM OF REFLEX ACTION.
(*From Colton's Physiology.*)

Reflex Action in Man.—In human experience, reflex action may be illustrated by tickling the bare foot of a sleeping boy. If this be done without awakening him, the first result may be a simple withdrawal of the foot. If the stimulation be increased, the central discharge may become more vigorous, and he will kick out. These movements will involve the discharge only of a center in the lower part of the spinal cord. If the irritation of the

nerve ends in the foot be still further increased, the ingoing current may reach a center in the upper part of the cord, controlling arm movements, and the boy, still sleeping, may strike out with his arms. It is possible, even, that parts of the brain may be roused to action and groans or other vocal results may follow, the boy still remaining unconscious.

Sneezing, coughing, winking, swallowing, jumping or crying out when suddenly startled, as by the report of a fire-cracker or the slamming of a door, are familiar examples of reflex action.

Common Misconceptions.—It is a very common error to assume that all reflex action is unconscious. We are, in most cases, conscious of the act after or during its performance, as in jumping at a sudden noise. But we are often, also, conscious of the reflex action before it begins. In the case of coughing, for instance, we are usually forewarned and strive to prevent or suppress the action, but in vain. The irritation is so efficient that the action goes on to its natural termination in spite of our inhibiting effort. Another error consists in supposing that reflex action excludes all activity or participation of the brain. In the case of winking, the action is usually purely reflex, and yet it can have no relation to the spinal cord. Some part of the brain must make the reflex response to the irritation of the eyeball.

The essential characteristics of reflex action are two: it must (1) be *externally stimulated* by some physical cause; and (2) it must *not* be *intentional*, or purposely done. Reflex action is only one form, but the typical form, of involuntary action. Its nature may be summed up as follows: Reflex action *must* be externally stimulated, *may be* unconscious, may or may *not* involve some part of the brain, but *must be* without intention, or the mandate

of the will. The act of walking, so often given as an example of reflex action, is not truly such, but only secondarily automatic.

Spontaneous, or Impulsive Action.—It may be noted that some of the movements of earliest infancy, as the aimless movements of arms and legs, kicking and squirming, do not answer to the above definition of reflex action, because not externally stimulated. They must, nevertheless, be produced by the discharge of nerve centers, originating motor currents. The same is true of the involuntary movements accompanying chorea, or "St. Vitus's dance." We infer, therefore, that they are due to weakness of the nerve centers, resulting in "leakage," or premature discharge. The same explanation may perhaps be made of the fidgeting and twiddling of hands and feet so often observable in "nervous" persons. These movements of the infant are called Spontaneous, or Impulsive movements, in distinction from reflex movements in the stricter sense of the term.

Summary.—The ingoing current set up by the stimulation of a nerve end may set up a motor current from one of the lower centers, resulting in muscular movements without mental control, and known as reflex action. These reflex movements are always externally stimulated; they may or may not be unconscious, but are wholly without intention or control of the will.

Those reflex actions involving activity of the cranial nerves center in the basal parts of the brain; those due to stimulation of the spinal nerves involve no activity of the brain, but are controlled by centers in the spinal cord.

Spontaneous, or impulsive actions, as in the aimless movements of infancy, are not externally stimulated, but are due to weakness or "leakage" of nerve centers.

The semi-conscious movements of walking are not truly reflex, but only secondarily automatic.

CHAPTER IX

SENSATION

Sensation.—When the nerve current set up by external stimulation passes the lower centers without being "reflected" and, reaching some part of the brain, affects it with sufficient force, there follows a mental result or feeling which is called Sensation. This result is too simple and elementary to admit of satisfactory definition; but we may say that *Sensation is the first and simplest mental result of the stimulation of an incarrying nerve.* It may or may not be followed by muscular action; but it is invariably accompanied by other mental activities, the consideration of which may be deferred for the present.

The Conditions of Sensation.—The necessary conditions of sensation are (1) a physical stimulus acting upon the nerve ends, (2) a physiological process involving changes in the nerve ends, the connecting nerves, and the brain, (3) the rousing of the mind to consciousness. Between the first two of these, we trace a direct and comprehensible connection; but between the last two, brain and mind, the connection is involved in mystery. Just *how* activity of the brain can bring about activity of the mind is a question which Psychology cannot answer, and Philosophy wrestles with in vain. But the uniform connection or concomitance between brain stimulation and sensation is a fact which admits of no question. Emphasis must be laid, at this point, upon the fact that sensation is a mental and not a physical fact. Sensations are *in the mind* and

not in the various parts of the body. One says that he has a pain in his toe, and so it surely seems to the unsophisticated person; but that is purely a matter of association. The nerve ends are in the toe, but the pain is in the mind only.

We must also carefully refrain from speaking of sensations as traveling or being "carried" from the periphery to the brain. Sensations cannot travel. Nerve currents pass from periphery to center; but sensations, never. We need, therefore, to distinguish between sensations, which are psychical, and nerve-impressions, which are physical. They may be thought of as having their point of contact in the cerebrum.

The Threshold of Sensation.—The stimulation of a sensory nerve may be inadequate and the resulting brain event too weak to produce a result in consciousness. Doubtless many stimuli are acting on our nervous system all the time of which, for various reasons, we are not conscious. The brain change must have a sufficient degree of vigor in order that sensation may follow. The mind seems to have a sort of inertia which must be overcome; and the level at which stimulation begins to affect consciousness has been denominated the Threshold of Sensation. Many stimuli are unable to cross this threshold, and yet they may collectively produce important effects upon our moods or general conditions of mind. This is especially true of nerve currents arising in the visceral organs. The threshold of sensation is very variable, being widely different in different persons or in the same person at different times. It is, for instance, much higher, or more difficult to cross, under conditions of extreme fatigue.

Quantity and Quality of Sensations.—Sensations differ greatly among themselves both in Quantity and Quality. In point of quantity, they may differ in intensity or

extensity. Intensity of sensation may be illustrated by the case of a deep pin-prick or a drop of boiling water on the skin; extensity, by the feeling arising from putting one's whole arm under water. The snap of an electric spark is intense; the rumble of thunder creates a feeling of extent. In either case, differences in quantity of sensation are due only to the force of the stimulus. Differences in quality, as the difference between sensations of sight and taste, are due primarily to differences in the structure and susceptibility of the nerve ends, or sense organs, which enable them to respond to specific stimuli only. Thus the nerve ends of the eye respond only to the stimulation of ether-waves with certain degrees of rapidity in vibration, while the nerve ends of smell respond only to the contact of certain substances in the gaseous form. These differences in the sense organs and their susceptibility to specific stimuli lead to the classification of sensations into several groups, on that basis, and give rise to the familiar term, the Senses.

The Senses.—What is a Sense? A sense is not an organ or group of nerve-ends, but a power of the mind. A sense is the mind's power to receive impressions of the outer world by means of a particular set of nerves, or part of the nervous system. For example, the sense of smell is the mind's power to be impressed through the agency of the olfactory nerves and their special connections in the brain.

The senses may be separated for study into two groups, General and Special. The Special senses are those whose end organs are highly specialized in structure and function, being thus responsive to one peculiar kind of stimulus. What are usually known as the Five Senses, viz., Touch, Taste, Smell, Sight, and Hearing, belong to this group. To this list, however, we must add the Muscular

Sense, at least, which was formerly not discriminated from Touch. The so-called General Sensibility includes all those sensations which arise in the bodily organism at large, and especially in the various tissues of the body, without definitely specialized end organs. The pleasure and pain quality, or tone, is especially prominent in connection with these sensations, which are often grouped together under the name of the Organic Sense.

The senses, again, may be arranged in two groups with reference to the service which they render, one group being devoted chiefly to the service of the body, through the indications which they convey of its conditions; the other serving, chiefly, the ends of the mind. These are the knowledge-giving senses, and thus are given higher rank, though no more vitally necessary than the body-serving senses.

Summary.—Sensation is the first mental result of the stimulation of an incarrying nerve. Its necessary conditions are (1) a physical stimulus, (2) a physiological stimulus reaching the brain, and (3) the conscious reaction of the mind.

Sensations exist only in the mind, and are not "carried"; nerve impulses "travel."

The level at which nerve stimulation begins to affect consciousness is called the threshold of sensation; it differs under different conditions and in different persons.

Sensations differ in quantity and quality. Differences in quantity are due to the intensity or extensity of the stimulus; differences in quality are due to differences in the end organs and in the specific stimuli to which they respond.

A sense is the mind's power to receive knowledge of the outer world by means of some particular set of nerves.

The senses are grouped as general and special; they may also be classified as those which serve the body and those which give knowledge in greater measure.

CHAPTER X

THE BODY-SERVING SENSES

Organic Sensations.—The Organic Sense comprises all those sensations which arise from disturbed or changing states of the various organs of the body, and which furnish indications of the condition of those organs. They include sensations arising from the alimentary tract, as *hunger*, *thirst*, *nausea*, and the feeling of *repletion;* those from the respiratory system, as the feeling of "*closeness*," *suffocation;* those arising from destruction of tissue or diseased conditions, as *headache*, *toothache*, rheumatic twinges, and all the category of bodily aches and hurts, including *fatigue*. Here, also, we place those undefined, systemic feelings whose presence one indicates by saying that he "feels first-rate" or feels "dull," "dumpish," or "out of tune." A general characteristic of all the organic sensations, along with their pleasure-and-pain quality, is their indefiniteness. The difficulty of locating their physical source is illustrated in the case of persons who have had the wrong tooth pulled through incorrect response to the dentist's questions, and also in the familiar difficulty of locating the exact spot of a dull rheumatic pain. The man who was "so thin that he could not tell a back-ache from a stomach-ache" need not have been diaphanous by any means.

The utility of these sensations is evident as indexes of our physical conditions, the soundness of our tissues and organs, and our bodily needs. The painful tone so often

characteristic of these sensations is the needed whip to compel attention to our physical dangers and necessities, to send us to the dentist or hold us back from excesses and imprudence. The organic sense is the health officer of our bodies.

The Thermal Sense.—Next to the organic sense in its generality, is the Thermal, or Temperature Sense, yielding the sensations of heat and cold. This sense was formerly not distinguished from that of touch, for the reason that its nerve ends are distributed through the skin. But experimentation finally established the fact that these sensations arise from the excitation of separate nerve ends devoted to this purpose. Some of these are susceptible only to contacts of relatively high temperature, and are known as *heat spots;* others only to contacts of low temperature, and are known as *cold spots.* These are closely interspersed throughout the skin, but may be located by the use of a metal pencil or needle. If this, when heated, be touched to a "cold spot," only the sensation of contact will be felt; the same will be true if a cold point touches a "heat spot." It should be remembered that "heat and cold are only skin deep." The temperature of the blood, and consequently of the flesh, does not vary greatly with the changes of atmospheric temperature. The temperature of the blood is confined within the range from 95° to 106° Fahrenheit, the normal temperature being from 97° to 98.5°. Sydney Smith, on a hot day, wished to "take off his flesh and sit in his bones." It would have answered as well to take off his skin only.

The Sense of Taste.—Next in the service of the body, may be named the Sense of Taste. Its end organs are found in the little projections, or papillæ, which give roughness to the surface of the tongue, and which enclose minute structures known as taste buds. As the nerve-

ends are buried within these taste buds, they can be reached and stimulated only by soluble substances, which must first be reduced to liquid form. These liquids then penetrate the outer covering of the papillæ and in some way, probably by chemical changes, affect the ends of the gustatory nerve. It will thus be seen that in drinking a glass of lemonade we actually taste only so much of it as soaks into the taste buds. This gives us the philosophy of using a straw in drinking such beverages.

The principal sensations of taste are four, *sweet*, *sour*, *salt*, and *bitter*. These may be called the "cardinal points" of taste. Besides these and their combinations, which constitute the true tastes, other sensations, which have been called "mechanical effects," are connected with contacts on the tongue. Among these are the sensations called "*puckery*" and "*hot*," such as those produced by pepper, alcohol, tobacco, tannin, etc. Alum, for instance, has a true taste (sour); but this is soon overpowered by the mechanical effect of "puckering." Ripe choke-cherries are sweet to the taste, but one has short space to realize that before the intense "puckering" sensation follows. The root of Indian turnip (Jack in the Pulpit) produces an intense prickling sensation. All these "mechanical effects" belong really to the class of organic sensations. The tongue is also an organ of touch, the tip of the tongue being more sensitive to contacts than any other surface of the body.

Smell.—The Sense of Smell has its end-organs in two small patches of mucous membrane hidden away in the upper cavities of the nose, called the *nares*. In these, are distributed the ends of the olfactory nerves. They are reached only by substances in the gaseous form or so finely powdered as to float in the atmosphere. These nerve ends are extremely sensitive and may be stimulated by incon-

ceivably small portions of matter. It has been calculated that $\frac{3}{1000000000}$ of a grain of musk can be distinctly smelled; and a substance called mercaptan can be smelled in still more minute quantities.

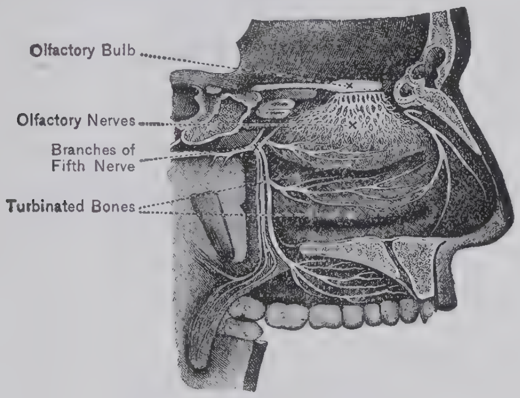


FIG. 7. THE ORGAN OF SMELL.
(From Colton's Physiology.)

The true smells, or odors, are many in number, but have no definite names like those of the true tastes. They are commonly classified only as agreeable and disagreeable. A certain group of smells are called aromatic, but there are few smell words of definite signification. Connected with the organ of smell, are also a number of mechanical effects, without, however, much well-defined difference in the mental result. Ammonia, camphor, the volatile juices of certain vegetables, as horse-radish and onions, when in contact with the mucous membrane of the nares, produce sneezing and even more vigorous effects, like strangling. Similar results follow the contact of pungent powders floating in the air, as snuff, pepper, and even dust. But these results are quite distinct from sensations of smell. The same is probably true of the effects produced by the air of a "close" room.

Confusion of Taste and Smell.—The confusion of taste and smell is a very common experience. Many substances, as fruits and cake or confectionery containing certain "flavoring extracts," as vanilla, peppermint, etc., when taken into the mouth and subjected to its heat and moisture and the process of chewing, give off vapors which rise from the pharynx into the upper cavities of the nose and produce sensations of smell. These, occurring in such close connection with real sensations of taste, are not discriminated from them, and all go in as "taste." The so-called cooking extracts have no true tastes, but only their respective odors and certain mechanical effects due to the alcohol which they contain. The taste of onions is sweetish, where any exists; their chief characteristic, even in the mouth, being their odor and the "strong" mechanical effect. If the nasal passages be properly obstructed, one cannot distinguish by taste alone peppermint or wintergreen lozenges from each other or from those without any "flavoring" element.

Uses of Taste and Smell.—Taste and smell are the "sentinels of the stomach." While affording some knowledge of the properties of substances, it is yet chiefly those properties which are of importance to our internal economy. Comparatively, smell is of the greater importance, not only because it reaches farther, is affected by more distant objects, but also because it more effectively warns us of dangerous properties or conditions, as of smoke, injurious gases, and foods or other substances in a state of decomposition.

It must not be overlooked, however, that an important function of these senses is pleasure-giving. The delights of the table, our enjoyment of fruits and sweets, is paralleled by our pleasure in the perfumes of flowers. Of course, this is partly counterbalanced by the suffering to

which ill-smelling substances subject us. It may therefore be remarked that the body-serving senses affect, more or less, the emotional side of our mental life. And as we rise in the series from the organic sensations to smell, this emotional result becomes more refined and more capable of intellectual discrimination.

Summary.—The senses especially devoted to self-preservation and the service of the body are the organic sense, the thermal sense, taste, and smell.

The organic sense comprises sensations arising from the alimentary tract and various other organs, including the pains of disease. They are characterized by indefiniteness, along with their pleasure-and-pain quality.

The thermal, or temperature, sense is distinguished from touch by its use of a distinct set of nerve ends known as heat and cold spots.

The sensations of true taste are sweet, bitter, sour, and salt; but certain organic sensations, or mechanical effects, arise in the covering of the tongue, as "puckery" and "burning."

Sensations of smell, or odors, are many, but lack distinctive names; they also are closely related, locally, to certain mechanical effects, as sneezing, produced by pungent vapors and powders.

The confusion of taste and smell is a common experience, as in the eating of many fruits and in the use of flavoring extracts.

Taste and smell are the sentinels of the stomach, but also have an important function as sources of pleasure and pain.

CHAPTER XI

THE KNOWLEDGE-GIVING SENSES

The Muscular Sense.—The most fundamental of the knowledge-giving senses is that known as the Muscular Sense. This and the Sense of Touch are so intimately related that they were formerly not discriminated; and some eminent psychologists attempt, even now, to dispense with or explain away the muscular sense. It seems clearly entitled, however, to a distinct name and treatment. The principal forms of muscular sensation are those of *movement* and *resistance*. Both measure, in a way, the amount of muscular energy which is being expended at a given instant, as in the "hefting" of bodies. The sensations of effort and movement are, nevertheless, quite other than the act of muscular contraction; they are *mental*. We are able, without the aid of other senses, to discern the fact of muscular movement, its direction and distance. We are, in like manner, able to discriminate the amount of nervous energy put forth to overcome resistance, whether it be in the form of weight, where the force of gravity must be actively resisted, or in that of *hardness*, *rigidity*, etc., where our effort is passively resisted by material objects. Coöperating with this consciousness of muscular strain are also, no doubt, feelings resulting from the friction of the joints and of moving muscles under the skin; but these are secondary.

The sensations of *fatigue* are not to be classified under

this sense, from the fact that they are due to disintegration of tissue, overloading the blood with waste matter, and not to the present tension of nerves or muscles.

Ideas Derived from Muscular Sensations.—It is by these distinctions of nervous strain that we first discern the position of external bodies with reference to ourselves and learn the fundamental properties of matter. The infant reaches for the moon as readily as for the watch dangled before his eyes; but by experiment, both through failure and success, he learns in due time what distance and direction mean in terms of muscular effort. It seems very possible that the first infantile consciousness is, after all, the consciousness of resistance, of obstructed muscular effort. Through these various muscular sensations, arise ideas of motion, extension, weight, hardness, rigidity, distance, and direction.

The muscular sense is thus of great importance to our mental life, giving us the original data for our knowledge of spatial relations and the fundamental properties of matter, the foundation, in short, for our knowledge of geometry and physics. As the organic sense is of primary importance to the body, the indispensable means of its preservation and welfare, so the muscular sense is fundamental to our acquaintance with the external world.

THE SENSE OF TOUCH

The Sense of Touch has its end organs distributed throughout the several layers of the skin, including the lining of the mouth and the covering of the tongue. These are of several different forms, namely, (1) Touch cells, (2) Pacinian corpuscles, (3) Tactile corpuscles, (4) End bulbs. Some of these are quite complicated in structure, as may be seen from the accompanying illustration.

These end organs are more sensitive or more numerous in certain parts of the skin than others. The finger tips, the tip of the tongue, and the edges of the lips are the most sensitive parts. The sensitiveness of the finger tips, especially, is developed to a wonderful degree in the case of the blind, with whom touch most largely takes the place of sight.

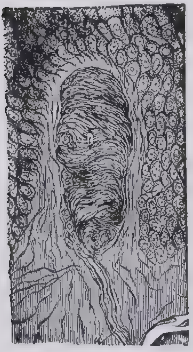


Fig. 8. Section of a Papilla of the Skin, Showing a Touch Corpuscle.

It has been thought by some biologists that touch is the original special sense, out of which the others have been developed. Thus it has been said that "the first eye was only a sore spot in the skin."

The sensations of touch proper are only those of *contact* and *pressure*, and pressure may be considered only as degree, or intensity, of contact. Extremely slight contacts are discernible, while severe pressure may result in such a degree of the pain quality, or tone, as to overpower the discriminative activity, or discernment of differences.

Intellectual Service of the Sense of Touch.—Sensations of touch are often highly pleasurable, as in various forms of caressing; yet their predominating value is cognitive. Thus we derive from contact, first, the idea of *extension*, and thus also of *superficial form*. This comes through what is known as "plurality of points," that is, through the number of points of stimulation, or of nerve ends, excited. The idea of motion may also be derived from the succession of stimulated points, as when we draw a pencil point across the skin, or in the progress of a fly or other creeping thing across the cuticle. From plurality of points, we also derive ideas of *surface*, as *roughness* and

smoothness, the rough surface being that in which the projecting points are relatively few and far apart, as in a rough-plastered wall contrasted with a polished surface. Some idea of weight may also be derived, as when a weight is placed on the back of a hand supported by a table. The pressing of the skin over the bones and knuckles may afford some criterion of the weight of the superimposed body.

Localization of Tactile Sensations.—The most interesting problem in connection with touch sensation is that of *localization.* How are we able to determine the precise point of our bodily surface on which an external body, as a pin or a mosquito, is impinging? This is explained by what is called the "doctrine of local signs." The infant is, at first, wholly unable to localize contacts or any other impressions, but through the agency of his aimless, spontaneous movements, and the resulting contacts and reactions, along with the coincidence of muscular and ocular sensations, he comes in time, through many experiences, to learn the geography of his skin. Each particular part of the skin is supposed to yield, under stimulation, its own peculiar "feel," which comes to be, unconsciously at last, both discriminated and firmly associated with its own non-interchangeable place of origin. We cannot now recall the great labor which was involved in forming these associations; but it was all accomplished in a time in which we had not much else to do.

The accuracy of this localizing power varies greatly with different areas of the skin. This may be tested by touching the skin at two points simultaneously, as with the points of a pair of compasses or scissors, and noting the distance between them necessary to produce a consciousness of two contacts. This distance is least on the tip of the tongue, where it is only four hundredths of an inch,

whereas, on the middle of the back the points must be over two inches apart in order to be distinguished as two.

Active Touch.—Some consideration may profitably be given to that familiar but often unrecognized coöperation of touch and the muscular sense which has received the distinctive appellation of Active Touch. Touch seldom works alone to accomplish intellectual results. For instance, we determine the character of surfaces not by simple contact but by moving the hand over the surface. The blind man discovers the form of objects by a combination of movement, contact, and resistance. The nerve ends of muscles and skin are brought into active operation at the same time. The blind man guides himself along familiar ways by means of a cane; but this, again, brings into simultaneous activity and coöperation the nerves of touch and the muscular sense. It is hardly possible, in fact, to bring the muscles into activity without involving some activity of the organs of touch; and these, in turn, are dependent on the muscles for their opportunity to act.

This distinction between active touch, a double sense so to speak, and passive touch, or touch proper, is one which should be clearly grasped and held in mind, lest the ambiguity of the term *touch* involve us at times in confusion.

The value and importance of active touch is emphasized by the fact that it is so often employed as a court of appeal from the other senses. "There are ghosts to all senses but one"; but whatever seems real to the touch has met the supreme test of reality. "Let me take hold of it," is our demand when we distrust our other senses.

Summary.—The most fundamental of the knowledge-giving senses is the muscular sense, which yields sensations of movement and resistance. From these are derived our ideas of spatial relations and the fundamental properties of matter.

The sense of touch, strictly speaking, is dependent on nerve ends in the skin, and gives rise only to sensations of contact and pressure.

From these are derived ideas of extension, motion, form, and surface.

Our ability to localize contacts on the various parts of the skin is explained by the hypothesis of "local signs."

The sense of touch acts so commonly in conjunction with the muscular sense that they are often conveniently spoken of as one, under the name of active touch. Thus coöperating, they furnish the final test of illusions in connection with other senses.

CHAPTER XII

THE SENSE OF HEARING

The Organ of Hearing.—The organ of Hearing is the ear. The stimulus capable of exciting it is found in waves, or vibrations, of air, within certain limits of velocity. The external ear, or *concha*, has little importance in hearing. The auditory canal is closed at its inner end by a membrane called the tympanic membrane, behind which is the tympanum, or drum, of the ear. This cavity is spanned by a chain of minute bones, called respectively the *malleus*, or hammer; the *incus*, or anvil; and the *stapes*, or stirrup. The malleus has an arm, or lever, the end of which is attached to the middle of the tympanic membrane. When the vibrations of air beat upon this membrane they are transmitted, causing the incus to waggle. It, too, has an arm, or lever, which moves the stapes back and forth, like a little piston, into the *foramen ovalis*, or doorway to the inner ear. The tympanic cavity, or middle ear, is connected with the pharynx by the Eustachian tube, which enables an equilibrium to be maintained between the atmospheric pressure within the tympanum and that outside.

The Inner Ear.—The inner ear, or *labyrinth*, is a very intricate affair. It comprises three parts, the *vestibule*, the *cochlea*, and the *semicircular canals*, which are, primarily, chambers or cavities in the temporal bone. The vestibule is the central chamber with which the other two communicate, and into which the oval foramen opens.

The semicircular canals are three hollow loops set in planes at right angles with one another. The cochlea is a spiral cavity, like the inside of certain spiral shells. Each of these bony cavities contains within it a membranous sac of corresponding form, known as the membranous cochlea and canals. These are surrounded by a fluid called the *perilymph*, which fills the bony chamber, and

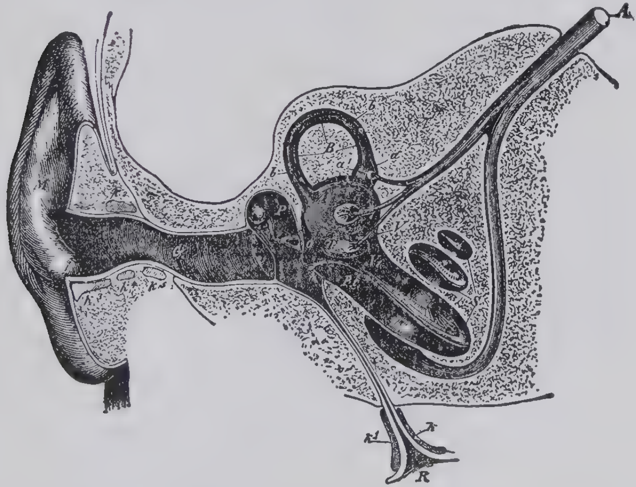


FIG. 9. SECTION OF THE EAR.
M, concha; G, auditory canal; T, tympanic membrane; P, tympanic cavity; o, oval foramen, or fenestra; V, vestibule; B, a semicircular canal; S, the cochlea; R, Eustachian tube; Vt, scala vestibuli; Pt, scala tympani; A, auditory nerve.

are filled by a similar fluid called the *endolymph*. The vestibule contains a double membranous sac, one part connecting with the cochlea and the other with the canals, while the two parts are connected by a small opening. The connection of the semicircular canals with hearing seems quite enigmatical. Recent investigation seems to assign them functions as a distinct sense organ for the

Sense of Equilibrium. This receives a degree of corroboration from the form of the organ itself, which seems qualified to act something like a group of spirit-levels set in three different planes. A disturbance in the perilymph of the canals seems, moreover, to produce a sensation of dizziness, as in whirling about rapidly, in swinging, and in falling. Slighter disturbances are sufficient to warn us that the body is getting "out of plumb."

The Cochlea.—The cochlea, which contains the ends of the auditory nerve, is extremely complicated in its internal structure and contents. The bony chamber or tube is divided, partly by a spiral shelf following the windings of the tube and partly by the basilar membrane which extends from the edge of the shelf to the outside of the tube, into two channels, the *scala vestibuli* and the *scala tympani*. The membranous cochlea, sometimes called the *scala media*, lies between these, the basilar membrane constituting its floor, so to speak. The *scala vestibuli* and *scala tympani*, thus separated, communicate at the top and are filled with the perilymph. Along the edge of the spiral shelf and connected with the basilar membrane, are arranged minute bodies known as *cuboidal cells*, *hair cells*, and the *rods of Corti*. All these are contained within the tube of the membranous cochlea, and are surrounded by the endolymph. They constitute the terminal apparatus of the auditory nerve. This arrangement is too intricate to be described here; but the ele-

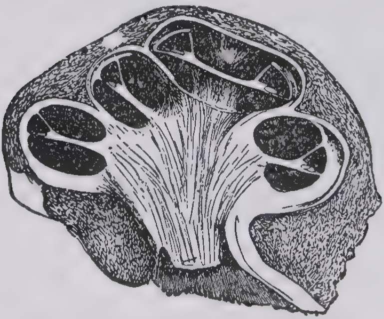


FIG. 10. A SECTION THROUGH THE COCHLEA.

ments of this apparatus are able to respond to all those differences in the stimuli which make possible the great variety of sounds, musical and otherwise.

The Physical Process of Hearing.—We may now trace, hastily, the process by which these nerve-ends are reached from the outer world and set into action. Air waves impinge upon the tympanic membrane and communicate their motion to it. This vibration is communicated, in turn, to the suspended, lever-like ossicles of the middle ear. The stapes, or stirrup-bone, plays into the *foramen ovalis*, and so sets up waves in the perilymph of the vestibule. The waves, or vibrations, of the perilymph spread upwards through the *scala vestibuli*, returning downwards through the *scala tympani*. In their downward course through the *scala tympani*, they ruffle the under side of the basilar membrane. They also communicate their motion through the walls of the membranous sac to the endolymph, which is thus set into similar vibrations, which, in turn, affect the fibers of the basilar membrane, which are of various lengths and have been thought to resemble in function the strings of a piano. On this theory, the rods of Corti are thought to act like the dampers of a piano.

This excitation of these organs results in sensory currents along the fibers of the auditory nerve. These currents excite the auditory centers of the brain, and sensations of sound follow. A more wonderful and delicate apparatus than this of hearing, involving so many and such various organs, and so hidden away and protected from even the minute pulsations of the outer air, it is beyond the power of mind to conceive. In fact, the human nervous system, in all its relations, is the greatest of all miracles and a source of ever-increasing astonishment to the thoughtful student.

The Physics of Sound.—As we have drawn upon Physiology to elucidate the process of hearing, in even its simplest form, we must now seek the aid of Physics in order to comprehend the great variety of auditory phenomena.

The sensations resulting from the process just described, and known collectively as sound, are classified as *noises* and *tones.* Tones are those sounds which result from a uniform rate of vibration in the outer stimulus, this rate varying for different tones from 32 to 38,000 per second. Noises result from irregular rates or confusion of vibrations. Tones are also known as musical sounds. They are often accompanied, and even obscured, by attendant noises. Thus a cataract, or a machine in operation, has its fundamental tone, or keynote, which may not be noticed by the inattentive person because of the attendant noises—rumblings or splashings—so much more prominent. The articulate sounds of human speech, also, have their respective fundamental tones, attended by noises due to friction of the breath against the teeth or other mouth-parts, and often predominating over the tone.

The Properties of Tone.—All tones have certain properties, as *pitch*, *loudness*, and *timbre.* Pitch is due to the *rate* of vibration in the sound waves. The lowest discernible pitch, or key, results from a rate of thirty-two, or, with some ears, sixteen vibrations per second. The "octave" of any tone results from a rate of vibration twice as great. The "middle C" of our musical scale has a vibratory rate of 256 per second. The highest note recognizable as a musical tone has, as already stated, a rate of about 38,000 per second.

Loudness of tone results from the *amplitude*, or breadth, of the sound waves. Timbre, or quality of tone, as shown in various musical instruments and the great variety of

human voices, is attributed to differences in the *form* of sound waves.

When tones of different pitch are heard simultaneously, the compound result may prove agreeable or disagreeable. If agreeable to the normal ear, it is called concord, or harmony; if disagreeable, a discord. Harmony results from a simple relation, or ratio, between the rates of vibration of the constituent tones. Thus, if the ratio is 1:2, we have only a tone and its octave. If the ratio were, say, 11:27, the result would be discordant. In what is known as the tonic chord, one, three, five, and eight of the scale, the ratios of vibration are 1, $\frac{5}{4}$, $\frac{3}{2}$, 2.

Another element of music is rhythm, or time, of which some mention will be made a little farther on.

Ideas Given by Hearing.—From its relation to music, the sense of hearing is largely a pleasure-giving sense, yet, through the aid of mental association, it becomes the mother of language and indispensable to the development and communication of ideas. It also aids somewhat in determining our space relations to the external environment. We discern the *direction* of sounding bodies with some accuracy under favoring conditions. This is due to the fact that we have two ears and both are stimulated, but unequally, by the same sound waves. We measure the comparative intensity of the two effects, and so infer the direction of the source. If this be directly in our front or rear, the effects will be equal; and we must then rotate the head in search of a difference in effect. Persons deaf in one ear have great difficulty in determining the direction of sounds.

The *distance* of sounding objects may be inferred with some accuracy when the exact nature or cause of the sound is familiar, through its comparative loudness; but the distance of unfamiliar sounds is largely a matter of

conjecture. We come, also, to associate the peculiar timbre of familiar sounds with the other properties of the bodies producing them, and so are able to infer their character and identity with more or less confidence.

Most psychologists seem to consider hearing as the original source of our ideas of time, doubtless from its intimate connection with the rhythm of music. While a poet may speak of lying awake "to hear time flowing in the middle of the night," the prosaic fact remains that we cannot *hear* time. It would rather seem that our primary consciousness of time must be connected with the muscular sense and muscular activity. If not, why is "beating time" with hand or foot so necessary to regulate the rhythm in musical exercises?

How Hearing Serves the Mind.—In smell, we come to the first sense which can be affected by objects not in direct contact with the organism. In hearing, we find this range greatly increased, as the air waves which stimulate the ear may travel a long distance before losing their force. The writer of this heard the discharge of artillery in the battles about Atlanta at a distance of one hundred miles.

The direct knowledge of the external world given by this sense is comparatively small; but it is here that we find the great means of thought communication, the indirect contact of mind with mind. It is through the auditory sensations of oral language that this contact is effected; and it is this fact which especially dignifies the sense of hearing. It, furthermore, through the service of music, lifts the emotional experience of man to a higher plane than any of the senses thus far considered.

Summary.—The organ of hearing is an exceedingly intricate and sensitive apparatus; its nerve ends are found in the cochlea of the inner ear.

The external air waves set up a vibratory motion in the tympanic membrane, which is passed along by the ossicles of the middle ear to the perilymph. Waves in the perilymph ascend and descend the channels of the bony cochlea and communicate their motion to the basilar membrane and endolymph, thus stimulating the delicate organs inside the membranous cochlea. These, by means of the auditory nerve, excite the brain.

The sensations of hearing are classified as noises and tones. Tones are sounds resulting from vibrations of a uniform time rate; noises result from irregular and conflicting vibrations. The properties of tone are pitch, loudness, and timbre, or quality.

Pitch results from the rapidity of vibration, which ranges from 32 to 38,000 per second.

The ideas directly derived from hearing are few, but its indirect service to the mind through oral language is incalculable, while it ranks very high in its service to the emotional nature through music.

CHAPTER XIII

THE SENSE OF SIGHT

The Organ of Sight.—The organ of sight is a seemingly more simple but no less wonderful instrument than the organ of hearing. The enclosing envelope, or eyeball, consists of three coats or layers. The outer, called the Sclerotic coat, is a tough, white membrane, which encloses the eye except in front, where the transparent cornea takes its place, like the crystal of a watch set in its case. Next within is the Choroid coat, a thin, black coat of great delicacy. In front, it is modified into the curtain called the Iris, the circular opening in which is called the Pupil. The iris contains certain muscles by the contraction of which the pupil may be dilated or contracted. The third, or inner coat, called the Retina, covers only the back portion of the eyeball, having the form of a cup or bowl.

The space within these envelopes is filled by certain transparent refracting media: (1) Immediately back of the cornea is a watery fluid called the Aqueous Humor. (2) Next, is the Crystalline Lens, a double convex lens of a jelly-like substance having considerable elasticity and enclosed in a capsule attached to the Suspensory Ligament. (3) The space between the crystalline lens and the retina is filled by a semisolid substance called the Vitreous Humor.

The Retina.—The eye is thus, in principle, a little camera, the retina corresponding to the sensitive plate.

The retina is formed by the branching of the optic nerve, which enters the eyeball at the rear and spreads its fibers radially in a series of nine layers, or films, resembling fine lace work. The fibers terminate in a complicated apparatus, including the so-called rods and cones, which are the true end-organs of the sense of sight. Two points, or small spots, in the retinal area are of special interest.

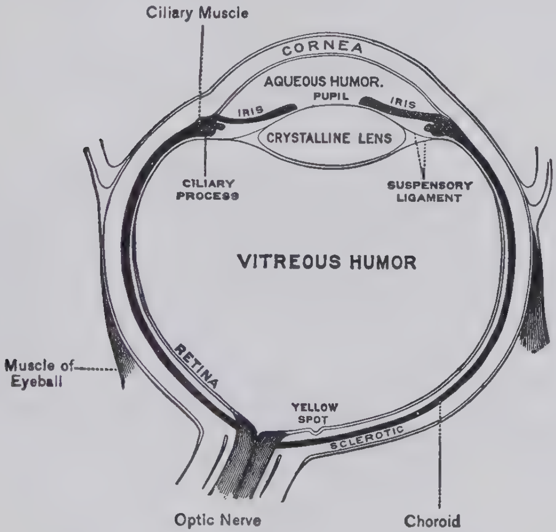


FIG. 11. HORIZONTAL SECTION OF THE RIGHT EYE.
(*From Colton's Physiology.*)

One, where the optic nerve enters the cavity of the eye, forming the stem of the retina, is called the *blind spot*, being devoid of sensitiveness to light. The other is the point of greatest sensitiveness, and is called the *fovea*, or yellow spot. This is not far from the center of the retina, the sensitiveness of which gradually diminishes towards its margin.

The Stimulation of the Retina.—The rods and cones of the retina are stimulated by waves, or vibrations, of a medium known as the *ether*, which pervades all space. These waves are of great velocity, ranging from 456 billions to 667 billions per second. They are thought of as entering the eye in rays, or lines, of "light." The rays in passing through the crystalline lens are refracted, or bent from their original direction, so as to converge and focus upon some part of the retina, forming what is known as

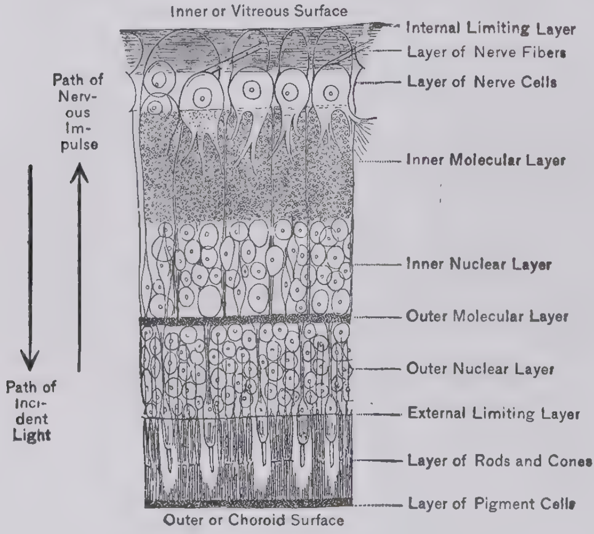


FIG. 12. DIAGRAMMATIC SECTION OF THE HUMAN RETINA. (Waller.)
(*From Colton's Physiology.*)

the *retinal image*, an illuminated area corresponding in form and color to the body or surface from which the rays proceed. Obedient to optic laws, the rays cross in passing through the pupil, and the image is consequently reversed, or inverted. Of course, an image is formed on each retina.

Accommodation.—In order that the light-rays may be properly focused upon the surface of the retina, so as to form the correct image, means are provided for changing the convexity of the crystalline lens to suit the varying distances of objects from the eye. This adjustment of the lens to the distance of objects is known as Accommodation, the accommodation of the eye to its circumstances. This change, according to the accepted theory, is accomplished by the contraction of the ciliary muscle, which eases the suspensory ligament and allows the lens, by its own elasticity, to assume a more convex form, which is

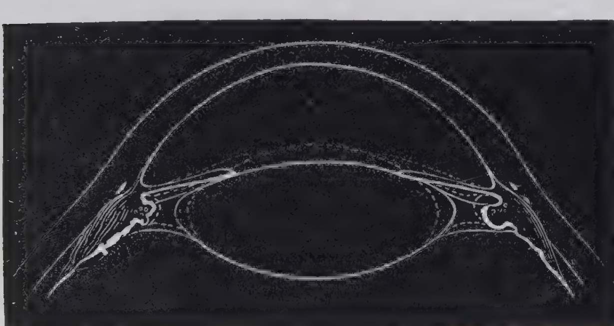


FIG. 13. DIAGRAM REPRESENTING BY DOTTED LINES THE ALTERATION IN THE SHAPE OF THE LENS IN ACCOMMODATION FOR NEAR OBJECTS.

needful in the vision of near-by objects. With advancing age, the lens loses this elasticity and is unable to assume the needful convexity. Spectacles then become necessary to supplement the refraction of the crystalline lens. The eye is naturally set for distant objects, and the apparatus of accommodation is most important to those whose vision is largely employed on objects small and close at hand.

The Muscles of the Eyeball.—The rotary movements of the eyeball are also important conditions of vision. In order that the rays of light from any seen object may be converged upon the more sensitive part of the retina, about the fovea, it is necessary that the axis of the eyeball be able to change its direction freely. These needful changes are controlled by six muscles known as the *recti* and *obliqui*. Two of the *recti* effect upward and downward movements; two others, movements to right and left, producing the convergence necessary in vision of near objects; while the two oblique muscles, running through loops which act as pulleys, are able to pull the eyes in directions between those produced by the *recti*.

Sensations of Sight.—The sensations of retinal origin are those of *light and shade*, or light in various degrees of intensity, and *colors*, the constituent elements of common sunlight. The different colors are due to different rates of vibration in the medium (ether), violet rays resulting from the highest rate of vibration and red from the lowest rate. While we number the prismatic, or rainbow colors as six or seven, there are but three primary colors, viz., red, green, and violet. All others, with the vast number of shades, tints, and hues, result from combinations of these, by superposition, in various proportions. White, as is well understood, results from the due combination of all the primary colors. Whether black is to be considered a distinct color or the absence of all color seems to be a matter of controversy. The "shine" or sheeny effect called *luster* is sometimes named as a distinct visual sensation.

Muscular Sensations of the Eye.—Visual perception or the identification of external objects by sight is not, however, accomplished by the unaided sensations of retinal origin. Much depends, also, on the interpretation of the

muscular sensations arising from the various eye-movements. The sensations resulting from the rotary movements, and still more those connected with the strains of convergence and accommodation, are of very great importance in what we call seeing things. The partnership, in fact, of muscular and retinal sensation in the act of vision is one of the many marvels of the nervous system in its service of the knowing mind.

Ideas Derived from Sight.—We are now prepared, in a measure, to consider the fundamental ideas which arise from visual sensation. (1) First in order, we may name those of *extension* and *superficial* form. These become possible, as in the case of touch, through "plurality of points" of contact. The number and relative position of the stimulated rods and cones, determining the extent and form of the retinal image, furnish the data for such perception.

(2) Ideas of *motion* may also arise out of retinal experience. When, for instance, a point of light crosses the field of vision, its rays first impinge upon one margin of the retina. As the point moves, a row of retinal elements are successively stimulated. Thus the pencil of light draws a line, or sort of scratch, across the retina in the opposite direction from that of the moving body; this is on the supposition that the eye remains fixed, which in practice will seldom if ever happen. For we instinctively turn the eye as soon as the margin of the retina is even slightly affected, so as to bring the rays upon the fovea. Thus the wave of stimulation will, as a rule, move from the circumference to the center of the retina. Any change in position of the center of stimulation signifies a corresponding, though opposite, change of position in the exciting object.

(3) Ideas of *direction* seem to originate in connection

with the combination of retinal and muscular sensations involved in the act of seeking out, or following, the positions of external objects. Thus *up* and *down* are connected with the elevation or depression of the axis of the eye; *right* and *left* are similarly connected with the corresponding eye-movements.

(4) Ideas of *size* are related, at first, to the extent of the retinal image; but, since this depends upon the distance of the visible object, our concrete ideas of size are judgments based on the supposed distance of the objects.

Ideas of Distance.—Our ideas of *distance* may, in like manner, in the case of known objects, be based on size. But the visual signs of distance are various and need special consideration. They are as follows: (a) The size of the retinal image, already considered above. (b) The degree of illumination of the image, the apparent brightness or darkness of the object. (c) Clearness or dimness of outline, a very important factor. Of course this is greatly modified by atmospheric conditions; hence the many amusing mistakes made by strangers in a dry and dustless atmosphere, like that in the mountains of Colorado. (d) The rapidity of apparent movement when either the object or the beholder is in motion, as when riding in the cars. The remoter objects are seemingly stationary, which gives the intervening landscape the appearance of rotation, or whirling. (e) The presence of intervening objects, which break up the distance into parts and thus greatly aid in its accurate estimation. (f) But besides these visual criteria, the muscular sensations of convergence and accommodation greatly assist in a proper judgment of distance. To test the energy of these last-named sensations, let any one hold a small object, as a pencil, at arm's length before his eyes, and fix a clear

gaze upon it; then quickly bring it within a few inches of the nose, keeping his eyes fixed upon it all the time.

Visual Signs of Distance.
- Retinal
  1. Size of retinal image.
  2. Degree of illumination, light and shade.
  3. Dimness or clearness of outline.
  4. Motion across retinal field.
  5. Intervening objects.
- Muscular
  1. Strain of convergence.
  2. Strain of accommodation.

Ideas of Solid Form.—Last but not least, we come to the service rendered by visual sensation in the genesis of our ideas of solidity, or form in three dimensions. Unquestionably, this idea is first reached through experiences of active touch in the grasping or handling of objects, the same being also true as to distance, which is, in fact, one of the elements of solidity. The eye cannot *grasp*, and it is only in combination with muscular data that visual sensations become signs of solidity. This combination is found in our *binocular perspective.* The fact that the two eyes are separated somewhat, thus occupying different positions with reference to the seen object, causes the two retinal images to differ in a discernible degree. This difference we have come to associate, automatically as it were, with what we have learned through our muscles concerning the solidity of objects. It is by this principle that the stereoscope, with views taken at slightly different angles, produces the illusion of solidity in connection with pictures on plane surfaces. Again, if a book, for instance, be held with its back towards one's face, in front, and looked at with one eye at a time, we shall easily observe the difference in the two views. One shows us the back and one side of the book; the other

eye sees the back and the other side. A look with both eyes combines the two; and thus, in a sense, the *two* eyes *can grasp* a solid object.

Another Retinal Sign of Solidity.—A purely retinal sign of solidity is found in the distribution of *light and shade* in the image of an object. This principle is utilized in the representation of solid forms by drawing. In representing a sphere, for instance, the concentric arrangement of the shading and the placing of the point of greatest illumination, or least shading, are clear indications of not only the solid form of the object but also of its position with reference to the eye. In looking at a rough surface, as the trunk of an oak tree, the roughness is faithfully indicated by the streakings of light and shade. And almost any one has had the experience of studying a skillfully painted cornice in a hall or large room in the often difficult endeavor to determine whether it truly or falsely represented relief and depression. Many optical illusions depend for their success upon our instinctive inference of solidity from light and shade.

It is evident that all these retinal signs of space-relation, distance, direction, etc., are dependent for their significance not only upon their connection with muscular sensations from the eye-muscles, but also on their association with the results of muscular activity and muscular sensation in the early months and years of childhood. Active touch has been not inaptly called the schoolmaster of the sense of sight. But in due time the pupil outstrips the teacher and becomes apparently, though not really, an independent agent. The data of pure sight would have little intellectual value if they were not thus indissolubly associated with motor sensations and experiences.

Inversion of the Retinal Image. — Before leaving the subject, brief consideration may be given to the question

which has troubled many as to the inversion and duplication of the retinal image. Why do we not see things double? It seems almost certain that infants do not at first have that single vision which in adults is the normal condition. In early infancy, the two eyes are not coördinated in their action, but move independently; so that the babe must have not two homogeneous images, but often entirely dissimilar ones. What the visual consciousness resulting from such a condition may be, we can hardly imagine. But, somehow, the movements of the eyes come, in time, to be coördinated; how perfectly may be seen by the following experiment. Close one eye and place the finger lightly upon the closed lid; then with the other eye look back and forth, alternately, at two objects some yards apart. The closed eye will be felt by the imposed finger to move in perfect unison with the other, and no effort of will can interrupt the simultaneous action. It results from this perfect coördination, that rays of light from any object will strike geometrically similar points, or parts, of the two retinæ, and thus produce identical impressions.

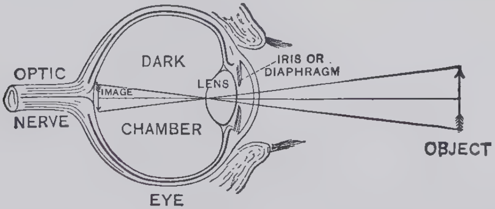


Fig. 14. Diagram Illustrating the Inversion of the Retinal Image. (*From Blaisdell's Physiology.*)

Why do we not see things upside down? It has been answered that infants do see in that manner at first, but that by means of active touch—touch and the muscular sense—they learn, in time, the true relations of things to

their own bodies, and form the habit of mentally *re-inverting* their images, this habit becoming, in process of time, wholly automatic and unconscious. Some experiments which have been made on an adult subject seem to confirm this view.

But it is to be remembered that the retinal image, as such, *never goes any farther* than the retina. It does not slide along the nerve to the brain, like a photograph down a tube. The brain event is of an entirely different nature from the retinal image. And even that is still a physical event, and the connection between it and the mental image remains inconceivable. The inversion of the retinal image would seem, therefore, to be a matter of practical indifference.

After-Images.—An interesting phenomenon in connection with the sense of sight is found in the duration of luminous sensations, this being greater than the duration of stimulus. Look for a moment, fixedly, at an incandescent electric light; then turn the eye away into space. A so-called After-Image of the luminous loop will appear before the eye, nor will it be removed by closing the eyelids. This, in time, will grow less bright, changing to a reddish color, and finally to a greenish or black outline, the whole effect persisting for possibly one or more minutes. This is due to what may be called the inertia of the retinal elements. A similar effect produced by the rapid rotation of a live coal or a burning stick, causing an apparent circle of fire, is familiar to all children. For the same reason, shooting stars seem to have tails. The composition of colors on the color-wheel by rapidly rotating sectors of different colors belongs in the same class of phenomena.

Thus far, we have been speaking of what are called *positive* after-images. There is another phenomenon

known as the Negative After-Image, of a different and more complex origin. Almost any one has had the experience of looking absent-mindedly at a picture on the wall and then, upon moving the head, of seeing upon the white surface of the wall a copy of the picture, but with light and shade reversed, the dark parts of the picture appearing light and the light parts dark, in the after-image. Similar results follow the fixed gazing at colors. Upon turning the gaze to the white wall, one has an after-image of the complementary color. What was a red spot will now seem to be green. These peculiar effects are supposed to be due to fatigue of the retina; but for fuller explanation the reader must be referred to more elaborate works upon the general subject.

Summary.—The eye is a piece of physical apparatus resembling the camera in principle. Its most important part, the retina, is formed by the branching of the optic nerve.

The rods and cones of the retina are stimulated by waves of ether having great velocity.

The proper focusing of the light-rays to form the retinal image is due to (1) the crystalline lens, and (2) a process of adjustment known as accommodation.

Muscles of the eyeball play an important part in vision, both in changing its direction and by furnishing muscular sensations which coöperate with those of retinal origin.

The purely retinal sensations are those of light and shade, color, and luster.

The ideas derived from sight are those of extension, motion, direction, distance, and both superficial and solid form.

The visual signs of distance and solid form are numerous, including muscular strains and various retinal data.

The inversion of the retinal image has occasioned much perplexity, but it must be remembered that the actual brain event is something differing widely from any illumination of the retina.

After-images are an interesting phenomenon, the so-called positive images being due to nervous inertia, while the negative ones are thought to be due to retinal fatigue.

- SENSATION.
  - The Body-Serving Senses.
    - 1. The Organic Sense
      - Hunger, thirst, nausea, repletion.
      - Suffocation—fatigue.
      - Pains of disease, injuries, etc.
    - 2. The Thermal Sense
      - Heat, cold.
    - 3. Taste.....
      - True tastes, or flavors—sweet, sour, salt, bitter.
      - Mechanical effects—puckery, burning, etc.
    - 4. Smell.....
      - Odors, various and unnamed.
      - Mechanical effects—from pungent vapors and powders.
  - The Knowledge-Giving Senses.
    - 1. The Muscular Sense
      - Sensations—movement, resistance.
      - Ideas—distance, form, weight, hardness, rigidity, etc.
    - 2. Touch....
      - Sensations—contact, pressure.
      - Ideas—extension, roughness, smoothness.
    - 3. Hearing...
      - Sensations—noise, tone, pitch, etc.
      - Ideas—direction, distance, time.
    - 4. Sight.....
      - Sensations—light and shade, colors, luster.
      - Ideas—extension, motion, direction, form, distance, solidity.

CHAPTER XIV

SENSE DEFECTS

Let the reader now attempt to state the results which would attend the elimination of any of the eight senses that we have named. Taking first the large group of sensations which we have included under the organic sense, would it not be a great relief to be released from all danger of hunger? How we could economize on our board bills! No thirst, no drunkenness perhaps; and then the happy immunity from toothache and all the other aches and pains that bring revenue to dentists and doctors! The reply to these suggestions will quickly present itself. Let the other "body-serving senses" be considered in like manner.

Coming to the knowledge-giving senses, what would be the effect of the complete elimination of the muscular sense? It would not deprive us of the power of motion; our motor nerves and the contractility of the muscles would still remain, only the sensory nerves from the muscles being nullified. But all voluntary regulation of the motor discharge would be rendered impossible, since there would be no means except eyesight for measuring its momentary effects; and the proverbial "hen with her head cut off" would fairly illustrate the character of our movements. A case has been reported of a mother afflicted with paralysis of the muscular sense, who could not hold her baby in her arms except by keeping her eye on it to prevent an unconscious relaxation of the muscles.

It is difficult to imagine the effect on our conscious life of a complete absence of the sense of touch, in its proper sense. Kissing and all other caressing would quickly go out of fashion, for one item. But a world without *contact* the mind is unable adequately to conceive. Our feeling of reality in the things about us would, seemingly, be immensely weakened if not abolished, and we should move as in a world of ghosts.

As a matter of fact, however, it is only the more highly specialized senses which are ever found defective, unless as a pathological condition. But the organs of sight and hearing, the senses the most important for the service of the mind, are not infrequently partially or wholly incapable, through defects of structure or as a result of disease, of performing their normal functions.

The Limitations of the Blind.—We may first consider briefly those total defects known as deafness and blindness, or, rather, the mental condition of those defectives known as the blind and the deaf and dumb. Let us approach the subject from the standpoint of the question, "Would you rather have been born blind or deaf?" What are the limitations of the congenitally blind? (a) They are, in the first place, cut off from all the pleasures of color. The entrancing beauty of sky and landscape, of floral tints and forms, and the light of human smiles are forever a sealed book. "Truly the light is sweet, and a pleasant thing it is for the eyes to behold the light of the sun," but not for the blind, who have no eyes. (b) All the intellectual discriminations based on differences of color and of light and shade, which form so important a part of space and form perception, are also denied. (c) The ability to read and get knowledge from books is fatally curtailed, since books for the blind are so few, so bulky, and so prohibitively expensive. (d) The

blind are so restricted in their power of moving about in unfamiliar places that they are far more dependent than deaf-mutes in the matter of gaining a livelihood.

The Limitations of the Deaf.—On the other hand, the limitations of the deaf are these: (a) They are cut off, firstly, from all the pleasures of music, of poetry and oratory, as such, and even from the sound of the human voice. They live in a world of silence, as the blind do in a world of darkness; and yet these have neither darkness nor silence as normally constituted persons are conscious of darkness and silence. (b) While their vocal organs may be perfect, their inability to hear the articulate sounds of others cuts them off from the possibility of normal speech and communication through oral language. But the most serious aspect, or result, of this is found in their *inability to listen to* the conversation of others. They are thus cut off from *asking questions*, lacking the power and also the stimulus which come to other children from hearing remarks which they do not understand. All that early education which the hearing child gets from the table-talk of the family and the mere ability to overhear and to ask questions is no part of the deaf-mute's heritage. This results in greatly retarding, if not entirely thwarting, his development in moral and religious directions. In all that makes for the awakening and enlightening of the higher nature, the blind child, in earliest years, has greatly the advantage of the deaf.

PARTIAL SENSE DEFECTS

Partial Defects of Vision.—Still more interesting and practically important to the teacher of children are those partial sense defects which do not amount to blindness or deafness in the ordinary sense of those terms. One of the commonest of these is *myopia*, or near-sightedness, which

results from too great convexity of the lens, or malformation of the eyeball so that the rays of light are focused before reaching the retina. Other defects resulting from malformation of the eyeball are *hypermetropia*, or far-sightedness, where the lens is too flat, or the eyeball too short, so that the rays would focus behind the retina; and *astigmatism*, in which case the front of the eyeball slightly approaches the cylindrical instead of the spherical form.

All these structural defects can be measurably overcome by the use of proper lenses, or "glasses." Success in the use of books and in the general work of the school is often greatly impeded by lack of such instrumentary correction, and the failure is attributed to stupidity which is due only to physical misfortune. It is of the utmost importance, therefore, that teachers be vigilant in detecting and reporting such defects at the earliest moment.

Color-Blindness.—An optical defect of different nature is that of color-blindness, due not to malformation of the eyeball but to some deficiency in the retinal elements, the rods and cones. The "typically," or completely color-blind person sees the world in monochrome, in gray, so to speak. A summer landscape produces on him the effect of a photograph or steel engraving rather than that of a water-color or oil painting. But very few persons are in this condition. Most color-blind people are defective with reference to only one of the three primary colors; they are *red-blind*, *green-blind*, or *violet-blind*. Red-blindness is the most common.

A plausible explanation—the Young-Helmholz theory—as to the cause of this defect holds that there are three kinds of retinal elements, each of which responds only to the rate of ether-vibration which belongs to one of the primary colors. If those nerve ends which respond to

the rate for red are abortive or do not function properly, the person is *red-blind*, and so on. Other hypotheses have been proposed.

Railroad companies have found it necessary to carefully examine their employees for the detection of this defect, as the inability to distinguish a red light, the danger signal, may often have serious consequences. Much, however, of what passes for color blindness is simply color ignorance, often only an ignorance of color names. In such cases, of course, the limitation can be forestalled, or even removed, by proper training in the discrimination of colors. The failure to give this in many schools is a culpable neglect.

Partial Defects of Hearing.—Partial deafness, sometimes due to removable causes, is also not uncommon. And, as in the case of defects of vision, the child is often at a hopeless disadvantage in his work through unsuspected dullness of the sense organ. The simple giving of such a child a front seat in the recitation room may often relieve him from the handicap. But all such defects should be promptly reported to parents, with clear intimation of the daily consequences.

Perhaps the most common of all sense defects is that form of aural dullness which consists in the inability to discriminate pitches, and the consequent inability to sing the scale accurately. We call such persons "unmusical"; and many seem almost to pride themselves on this condition, not appreciating the fact that it is really a physical deformity. The term tone-deafness, as analogous to the term color-blindness, might be appropriately applied to this form of defect. In most cases, it can be overcome or forestalled by proper training of the ear in early years.

Perhaps it might be said that many people are *tone-stupid* instead of tone-deaf. Their unmusical condition

is the result of neglect rather than of structural deformity. Where real tone-deafness exists, it interferes with adequate expression in reading and elocution as well as the ability to sing. It will easily be seen that there are strong reasons for insisting upon musical instruction in the elementary schools.

The Blind-Deaf.—Much interest has been felt by all students of mind in the remarkable cases of Laura Bridgman and Helen Keller, who suffered in very early years a total loss of both sight and hearing. Laura Bridgman lost also the senses of taste and smell. Yet, through the infinite patience and skill of their special instructors, both became, in a sense, educated persons. Much has been written about Helen Keller which is probably somewhat apocryphal; but enough of unquestioned fact remains to make her case one of great interest and importance to educators. But these two women are both phenomenal; they stand out in strong contrast with the great body of defectives, and constitute a notable problem for the psychologist.

We should always remember, what we are in great danger of not realizing, that no person deficient in any one of the senses can possibly have the *same sort of mind* as if in possession of all the senses. In the congenital deaf-mute, for instance, a whole segment of mind is hopelessly and irrevocably wanting. In the congenitally blind person, another segment is wanting. Helen Keller is neither "eye-minded" nor "ear-minded," but *touch-minded* and *motor-minded.* Laura Bridgman wrote a few specimens of what she thought to be poetry. The result would be laughable if it were not pitiful. The metaphors, which are the essence of poetry, based on perceptions of color and sound, to say nothing of the metrical element, must be absolutely beyond the apprehension or

the imagination of such a person. Yet it is very hard for the normally constituted individual to realize the full and necessary force of such limitations.

Summary.—Perfection of function in all the senses is essential to normal mentality. All defects in sense organs affect in various ways and degrees the character and range of the sensations and consequently of the ideas derived from them. This effect is greatest in the case of the knowledge-giving senses, and especially of sight and hearing.

The congenitally deaf suffer loss of the pleasures of music, of the ability to speak, and, worst of all, of the ability to overhear conversation and to ask questions.

The congenitally blind suffer loss of the pleasures of color and light, of the ability to read to any extent, and of physical independence.

Partial defects of vision are those known as myopia, hypermetropia, and astigmatism, and the retinal disability called color-blindness.

A partial defect of hearing, the inability to distinguish pitches, corresponds to color-blindness in vision.

Persons lacking both sight and hearing, as Laura Bridgman and Helen Keller, furnish an interesting study in psychology; but it should be remembered that no person afflicted with any serious defect of the special sense organs can possibly have a complete mind or life experience.

CHAPTER XV

PERCEPTION

Sensation and Perception.—In common thought, no clear distinction is recognized between sensation and perception. In the preceding chapter on Sensation, much has been anticipated which belongs properly to Perception. We are now prepared to take up this activity more explicitly, and discover in what respect it is a distinct operation of mind.

Sensation is, as we have seen, a state of feeling, the result of impressions from without. It is, in a sense, passive; the mind is acted upon from without and responds in the simplest possible way. But the response does not stop with mere sensibility. The mind instinctively goes back of the sensations aroused and asks to what they are due, attributes them to a cause outside the mind itself. Sensation is a *state* of *feeling;* perception is an *act* of *knowing.* We have called sensation the first mental result of the stimulation of an incarrying nerve; we might, in like manner, call perception the second mental result of the stimulation of an incarrying nerve. Sensation, like other feeling, is subjective; what we feel is *ourselves,* our own states. Perception is objective; what we perceive is something external to our mind.

The Process of Perception.—But this process of referring sensation to its cause is by no means so simple as is ordinarily supposed. It usually involves the following steps, or phases:

(1) Discrimination, the consciousness of change and difference. The present sensation is a newly risen element in consciousness.

(2) Assimilation, the recognition of this new sensation as similar to some former sensation, its identification with former experience.

(3) Localization, which includes two facts, (a) the determination of the particular part or organ of the body whose excitation is responsible for the given sensation, and (b) the instinctive projection into space, by what has been termed the "eccentricity of sensation," of the exciting cause, or object. We have already made reference to the first of these acts in connection with the sense of touch.

(4) Representation. There arises in consciousness a reproduction, or imaging, of past experiences, known as the representative element in perception. How important a part this plays will presently be seen.

(5) Inference, or the final reference of the sensation to its external cause.

It is not meant that these steps in the process of perception follow one another in distinct succession; it would be as accurate, perhaps, to say that they occur simultaneously. Neither statement would be strictly true; but the analysis shows perception to be a complex process, and far from the simple act which it is popularly thought to be.

The Perceptive Act Illustrated.—Some illustration may be necessary to make clear the preceding statements. Suppose one lying in bed, in the darkness of the night, to have certain sensations of sound, noises. There will follow, first, the discrimination of this condition of consciousness from the previous silence and from other concurrent sensations, as those of warmth or contact. The new sensations are assimilated, or classified as noises.

They are localized not only as originating in the ear, but are mentally projected into space as coming from the street without. A representation, or image, arises in mind of objects or causes associated with similar sensations in former experience, as a baby carriage trundled on the sidewalk, or a loaded dray. Finally, we settle upon a satisfactory association and refer our sensation to its accepted cause. This process may not be slow or labored; it may all come in a flash as the listener says, "I wonder who is trundling a go-cart at this time of night."

Again, one experiences a feeling of pain which he distinguishes from other coexistent sensations and classifies as a pricking or stinging sensation. By its "local sign," he locates the stimulation as on the back of his neck. Images arise in mind of the possible cause. Now is the time for caution. His treatment of that cause will wisely vary with the inference he draws. If he infers a mosquito or fly, his action will differ from the safe one if he infers a wasp.

It will be recognized that the closing step in perception is an implicit judgment based on the comparison of experiences past and present.

We may now define perception as the *interpretation* of sensation, or the reference of sensation to its outward cause. We may say that

$$\text{Perception}=\text{Sensation}+\left.\begin{array}{l}\text{Discrimination}\\ \text{Assimilation}\\ \text{Localization}\\ \text{Representation}\\ \text{Inference}\end{array}\right\}=\text{Interpretation.}$$

Perception Further Characterized.—The term perception is properly applied to the *process*, while the *product* is called a percept. A percept is that idea which we have of an external object while it is acting upon our senses.

It should be noted that a percept is seldom related to only a single sensation. It usually combines a group of associated sensations, as in our percept of an apple. We have visual sensations of light and shade and color; active touch gives impressions of hardness, smoothness, and solidity; the sense of smell makes its contribution; while images arise of its taste and internal structure. All these the perceiving mind fuses into one experience, the percept of an apple. But a drayman handling a barrel of apples might, from simply the sensations of smell and muscular resistance, infer the presence of apples. This also is an act of perception, though the representative element is larger than in the former case.

It has been said that sensations bear something of the same relation to percepts that letters do to words. We spell percepts out of sensations; but sometimes we need only to see a few of the letters in order to spell the whole word.

The beginner in this subject must guard against confusing the percept and the perceived object. Percepts, like sensations, are purely mental entities, existing only in the mind. The perceived object, as a physical entity, must exhibit certain attributes or conditions: (a) It must be capable of exciting the end-organs of one or more of our several senses. (b) It must be present, here and now. (c) The mind must assign it definite position in space.

Do We Ever Have Pure Sensations?—The question naturally arises, Do we ever, in adult life, have pure sensations, on which the mind does not react by way of interpretation? It seems clear that in earliest infancy all sensations are thus pure, or mere sensations. The babe has, at first, no power or means of interpretation; he does not know what his sensations mean. The power of per-

ception develops slowly and gradually. But, once developed, the habit of referring all sensations to physical causes becomes so strong that some reference is unavoidable under ordinary conditions. The reference may be mistaken, but it is no less an act of interpretation.

The nearest approach which we now have to pure sensation, unless we except the organic sensations, may perhaps be found in the transition state or moment between sleeping and waking. Some sound may have barely awakened us, and we say, in a half-dazed fashion, What was that? But any repetition of the noise will be promptly interpreted. In busy, preoccupied moments we might, perhaps, become conscious of a pleasant odor without giving it sufficient attention to refer it definitely to a flower or other source; but, even thus, there would be at least some act of discrimination and assimilation, distinguishing the sensation as an odor and as pleasant or unpleasant.

Illusions.—Since perception is essentially the intellectual interpretation of sensations, it follows that we may have *false* perceptions. A mistaken interpretation, or false perception, is called an *illusion.* The timid foot-passenger on a starlit night may find a tramp, or even a spook, in what closer observation would resolve into a wind-swayed bush or a grazing sheep. Many wonderful illusions are artificially produced of a nature to make one "doubt the evidence of his senses." But our senses always tell true; it is the intellect which goes astray in its interpretation. In cases of illusion, there is always a perceived object, something acting on the senses, but it is wrongly perceived. This often results from some preconception possessing the mind at the time, the representative element in the perceptive process thus gaining undue prominence.

Training in Perception.—Training in perception, while

it involves exercise of the sense organs, is not really a training of those organs, but a training of the mind. Its essential factor is a discipline of the power and habit of attention with reference to the several steps of the perceptive process, and especially the fundamental ones of discrimination and assimilation, or, in a single word, comparison. Much of the careless, slipshod observation in the world has its cause, primarily, in sense defects as yet undiscovered. For instance, the near-sighted child cannot see things clearly, and so takes little interest in seeing. He does not form the *habit* of seeing things, as flowers, colors, etc., critically and appreciatively. But, on the other hand, lack of the observing habit is often due to mere neglect or indifference on the part of all concerned.

Much attention should be given by both parents and teachers to the cultivation of the power and habit of accurate observation. The chief instrumentality for accomplishing this important result is, after all, only the simple device of wisely using the index finger. The child's interest only needs direction. The thoughtful guide of childhood will be constantly saying, "See there! See how bright—or how curious or how rare—that is!" An alert habit of mind, and watchfulness for whatever is novel or significant or beautiful, may thus be easily established in early years by the simplest means. Of course, the parent or teacher needs first to have himself an observant mind and a comprehensive interest in the environment.

More formal exercise of the observing faculty should also be provided for in the lower grades of school in the way of lessons in color and form, and in the various phases of manual training and nature study. Other results of value besides the power of observation will thus be incidentally secured.

Summary.—Sensation is a *state* of *feeling;* perception is an *act* of *knowing.* Sensation is subjective; perception is objective.

The process of perception is complex and involves the several factors of discrimination, assimilation, localization, representation, and inference, resulting in interpretation, or the reference of sensation to an outward cause.

The act of perception usually involves the grouping of sensations, though some of these may be mentally represented instead of being actually felt.

The term perception is applied to the act, or process; the product, or resulting consciousness, is called a percept.

A perceived object must be (a) capable of exciting sensory nerve ends, (b) present here and now, (c) assigned to a definite position in space.

In adult life we seldom, if ever, have pure, unreferred sensations.

Illusions are mistaken perceptions; the sensations are actual, but wrongly interpreted.

Training in perception is a training of the mind to use the sense organs effectively, and the first step towards this is the arousing and directing of the child's attention to things about him.

CHAPTER XVI

ATTENTION

The Distribution of Consciousness.—We are now prepared for a fuller consideration of consciousness, and especially that phase of it called Attention. Consciousness has already been characterized as any form of mental activity; it is *awareness* of external phenomena and of ourselves, of our own exercise of knowing, feeling, and willing. As related to external objects, we are conscious of many things at the same time, but in different degree. The field of consciousness, at most times, is wide. We may borrow a useful illustration from the functioning of the retina. As we look out upon an extended scene, a thousand individual objects imprint their images upon the retinal area, but, owing to the structure of the retina, not with equal effect. Images occupying the central part of the field of vision gain access to the more sensitive part of the retina, and their mental result is therefore more intense than in the case of those objects which impress only the marginal portions. The field of consciousness, like the field of vision, may be considered as partly focal and partly marginal, a fact to which Professor Lloyd Morgan has serviceably called attention. To put the matter in another way, consciousness is not evenly distributed throughout its field; some parts, or objects, are in its focus while more are marginal.

Attention Defined.—Attention is focal, or intensified, consciousness, the concentration of consciousness upon

some objects in preference to others which remain in consciousness but are comparatively neglected. Attention is thus selective in its action, and involves a narrowing of the clear field of consciousness, as looking through a microscope narrows the field of vision. Attention is not a distinct faculty of the mind; it is not a peculiar form or kind of consciousness, but only a high degree of consciousness. A lens may focus rays of any color—to form a field of high illumination.

Conditions of Attention.—This concentration of consciousness, or attention, is an indispensable requisite for all effective and successful intellectual activity; it is therefore of the utmost consequence to the educator that he understand clearly the conditions on which its presence depends. (1) First, we may name the physical condition of *brain vigor*, a fresh and healthful condition of the cerebral hemispheres and the nervous system as a whole. Efficient attention is not to be expected when the brain and nerves are greatly fatigued or in any diseased or abnormal condition. A headache or a state of drowsiness is not conducive to mental concentration. An anæmic or ill-nourished condition of the bodily organism is inimical to prolonged mental concentration.

(2) A second condition is that of efficient *stimulus.* The mental effect which will be produced by this depends on (a) The *quantity* or force of the stimulus. A bonfire or a flash of lightning compels greater attention than the flame of a candle. (b) The *quality* or kind of stimulus. A red light may command keener attention than a yellow one. The taste of grapes may excite consciousness more than their smell. A musical performance may command attention either by its excellence or its badness. (c) But the greatest effect of stimulus is found in connection with *change.* A stimulus might be of such quality or quantity

as not to surmount the threshold of consciousness while it remained uniform, yet a slight change in either would instantly arrest attention. Thus the faintest shadows or changes of illumination in a dark room will receive prompt attention and interpretation. The hawk may not find the mouse while the mouse sits still, but the slightest movement brings him down upon the prey.

(3) Last, but not least, attention depends upon *interest.* "Interest is the mother of attention, attention is the mother of knowledge; if you would win the daughter, make sure of the mother and grandmother." Yet it is also true that attention may become the mother of interest.

Interest.—Fuller consideration must here be given to the meaning and office of Interest. What *is* interest? When do we call a book or a performance interesting? When it excites our feelings; when it makes us laugh or cry or excites our indignation or sympathy. Interest is *any kind of feeling* that arouses the act of attention. The most important kind of interest is that which arises in connection with knowledge and the quest for truth. One form of this we call *curiosity.* By this term we may designate the desire of the child, or the gossip, to know more about small things, or the eager thirst of the scientific investigator to know the whole truth about large things. The causes which excite interest are of importance to the teacher. They seem to be found in the proper relating of the two principles of *novelty* and *familiarity*, as these respectively call forth the acts of discrimination and assimilation. We are always glad to go away from home and encounter the novel; we are equally glad to return to the familiar environment of home. We are interested in the crowd of strangers at the World's Fair, but intensely interested in the fellow townsman or neigh-

bor whom we may discover in the motley crowd. We are interested in new books, but we love the old stand-bys. The novel must not be too novel; an object about which we could predicate absolutely nothing would not command any interest or attention. An object about which we had nothing more to learn would be equally uninteresting. "Similarity amid diversity" is everywhere the condition which stimulates the mind to its most profitable and effective exercise.

Kinds of Attention.—Two varieties or forms of attention are distinguished, Non-voluntary or Automatic, and Voluntary. Automatic, or Reflex, Attention is that due to the attractive force of the object or stimulus. While it involves the expenditure of nervous energy, and so may be physically exhausting, it does not involve the effort of will. The attention which one gives to a conflagration is an extreme example; also the consciousness of one hearing the roar of an oncoming tornado. Like Coleridge's wedding guest, "He cannot choose but hear."

The attention of children is chiefly of this non-voluntary sort. Moreover, it is very fleeting, changing momentarily with the changing stimulus. The young child is the victim of his sensory environment, a prey to stimuli, at the mercy of present, immediate interests.

Voluntary Attention.—Voluntary Attention is distinguished as that which is under the direction of the will. The mind is thought of as actively taking the matter into its own hands and setting aside or vetoing the present stimuli which clamor for recognition. This is done under the pressure of a far-reaching purpose, a future result held firmly in view. It might thus be said that voluntary attention, no less than non-voluntary, is determined by interest, the fundamental difference being, after all, only that between *immediate* and *remote* interests.

Voluntary attention is characteristic of the trained adult mind; it is not, however, a persistent state. The will can bring the mind and object together, but if some present interest does not supervene, if voluntary attention does not soon merge into non-voluntary, it will loose its grip and a new direction be given to it. The student grappling with a new and difficult lesson furnishes a pertinent illustration. If an interest does not speedily develop in some part or phase of the lesson, catching and holding his attention, his mind will relax and wander. He must then pull himself up and introduce his mind anew to the lesson. If he does not at length succeed in "getting interested" in the topic itself, he will abandon the effort in despair or disgust. A different example may be seen in our experience with a new book, even a novel. The first chapters go hard; automatic attention does not develop rapidly enough, and it is only by repeated acts of will that we hold on till the plot and dialogue have generated a body of feeling or present interest, which furnishes sufficient motive to send us forward. But this body of feeling may finally become so great that we find it as difficult to break off as we did to begin. The great office of will, therefore, in connection with attention is that of initiative, of bringing mind and object into such contact that the uninteresting shall become the interesting. And the will must have the backing of a clearly defined and highly esteemed end, or purpose.

Choice of Interests.—But the will also acts in another way, by a balancing of conflicting interests and the inhibition, or setting aside, of some that others may have possession of the field. Thus the will may be said to determine what interest or kind of interests shall prevail at a given time. The act of inhibition—literally, holding in—the checking of an impulse, consists often, if not always, in

the displacement of one action by another. Thus a boy frightened by the sudden appearance of a dog may inhibit or check his impulse to run away by moving towards the dog. An impulse to contract one set of muscles is overcome by innervating the antagonist muscles. The same principle applies to the relation of ideas in consciousness. I turn away from or banish unwelcome ideas by summoning others to occupy or divert my attention, much as a nurse quiets a hurt child by getting him to look out of the window. The nurse controls the emotional state of the child simply by playing one stimulus against another; none the less, she controls it. And so the student checks his mind-wanderings by perseveringly pulling himself up and setting before his mind anew the remoter interest or end for which the study was undertaken.

Summary.—We are conscious of many things at the same instant, but not to an equal degree. The focusing or concentration of consciousness, called attention, may be compared to the focusing of light on the retina, and consciousness may be discriminated as focal and marginal. Attention is focal consciousness.

$$\text{Attention depends on}\begin{cases}\text{Brain-vigor.}\\ \text{Stimulus}\begin{cases}\text{Quantity.}\\ \text{Quality.}\\ \text{Change of.}\end{cases}\\ \text{Interest, which depends on}\begin{cases}\text{Novelty.}\\ \text{Familiarity.}\end{cases}\end{cases}$$

Interest is any kind of *feeling* which excites the effort of attention. Curiosity is one form of interest.

Attention is of two kinds, or types, voluntary and involuntary. Involuntary attention is that due to the attractiveness of a present object. Voluntary attention is that due to an act of the will aroused by some remoter interest, or object of desire.

The function of the will in attention consists in introducing the mind to the object and in bringing it back to the object when it has relaxed or wandered. It also operates through the choice of the interest which shall be allowed to act, and in the checking or inhibition of competing interests.

CHAPTER XVII

MEMORY

Representation.—The effect of a perceived object upon the brain and mind does not wholly cease with the act of perception. We have seen in our analysis of the perceptive process that it contains a factor which we called Representation, the revival, in some way, of past sensations or experiences with which the present ones are identified or assimilated. Here, then, with the very beginning of perception, we have also the beginning of Memory. We must now mark the distinction between *percepts* and *images.* A percept is the idea, or notion, which we have of an external object while it is acting upon our senses. An image is a similar idea which we have of an individual object or event which is *not* present to any of the senses. At night and out of doors, one may have a percept of the moon; at any time, one may close his eyes and call to mind an image of the moon in any one of its particular phases. One may have, at will, a clear image of a deceased friend of whom percepts are no longer possible. Such an image is a remembered percept, or memory-image. It is a more or less perfect copy of a former percept. The image is believed to be occasioned by the activity of the same parts of the brain that were concerned in the exciting of the original percept. The percept is, normally, more vivid than the image; and this vividness probably gives that feeling of reality which the mind attaches to a perceived object. Our images, however, as in dreams,

have sometimes a degree of vividness which causes them to be illusory. A lady, known to the author, dreamed on one occasion that she was invited out to tea on the following Thursday evening. When the time came, she responded to the invitation, and was greatly chagrined, in the course of events, to find that she was self-invited.

Phases of the Memory Process.—Memory as a process involves three factors or phases, namely, Retention, Reproduction, and Recognition. The nature of retention has been, in the popular understanding, greatly misapprehended. The mind has been thought of as a sort of storehouse, or case of pigeon-holes, in which images of past experiences are stored away, like old negatives in a photographer's back-room, to be pulled out again as occasion requires. This conception is very wide of the fact. If the question be asked, "Where are our ideas when they are not in consciousness?" the only valid answer must be, "*Nowhere.*" If I crook my arm and then straighten it again, where is the crook then? Gone forever, non-existent.

The mind is not a receptacle; it is an activity. We shall never have again the image or percept of the present moment; it will be *another one*, closely similar to the present one but not identical with it, for neither the conditions nor the mind itself will ever be again exactly the same as now. The same part of the brain will function again in reproducing the image, but it will be a new act and produce a new copy of the original percept. That these copies vary slightly with each recurrence may be seen in the case of experiences often recalled through a series of years. Our memories slip. I recall with seeming clearness certain experiences as a soldier in the Civil War, and have often recalled them, but my old army diary sometimes tells a different story from my seemingly clear memories.

RETENTION

Retention Defined.—Retention may, then, be defined as the *permanent possibility, due to modification of brain structure, of reviving past mental experiences.* Every mental act leaves the brain a little different from what it was before or would otherwise have been. The gnarled oak contains within its tissues a record of all that has happened to it through frost or sun or storm; if we had the eyes to read this record we could know the whole life-history of the tree, in its knots and rings and the twist of its fibers. In like manner the brain builds and organizes a record of all its activities and vicissitudes. Every new experience works a change in structure, and the persistence of these changes is "retention," or the physical basis of memory. Retention is, thus, primarily a physical result, registered in the brain and nerves.

Nature of the Brain Changes.—What the exact nature of these brain changes may be is mostly a matter of conjecture. Some have imagined it to consist in a change in the shape of the brain cells, or new groupings or arrangements of brain cells, or the forming of new paths in the brain, new relations between the neurones, or all these things together. The most we are safe in asserting is that mental activity leaves *traces* in the brain, that these traces are deepened by each repetition or revival of the experience, and that activities which have once occurred occur more easily again. The first occurrence establishes a tendency to recurrence.

These "traces" have been compared to grooves, which are deepened more and more by continued repetition of the experience producing them. Imagine a slope of land, well harrowed and smoothed, upon which a heavy rain comes down. The water will not pass off in a thin sheet, but will gather into rills, and these will follow the lines of

least resistance. In the dry time following, the wind and other agencies may fill up these rills, or grooves, with dust and débris; but when the next rain comes it will not dig new courses, but clean out and follow those first traced. And each recurring storm will but deepen the original channels. So with the nervous pathways of our brains.

The Conditions of Retention.—The conditions on which the depth and permanence of this registering of impressions in the nervous system depend are partly mental and partly physical. They are (1) Attention and (2) Repetition. The conditions of attention have already been discussed. It will be recalled that the most important of these is the form of feeling known as interest, a purely psychical antecedent, while an important place is also held by brain conditions and the character of the stimulus, both, primarily, physical conditions.

Repetition, while more mechanical than interest and attention, nevertheless plays an important part in the deepening of impressions and the modification of the nervous system. The analogy between the effect of the repetition of mental experiences in the deepening of brain traces, or paths, and that of the repetition of acts and causes in the purely physical world has already been suggested in our illustration of the falling of water upon a slope of ground. Repetition is especially useful, and sometimes the sole resort, in cases where interest fails or cannot be developed, as in learning the multiplication table. It also serves as a valuable reinforcement to the work of attention. The whole force and value of habit rests largely upon the effects of repetition.

Reproduction.—Reproduction, the power and the act of recalling or reinstating past percepts and images, depends of course and primarily upon retention, as already defined. Readiness and accuracy of recall are also

dependent on the *recency* of the original experience or, at least, the recency and frequency of previous reproduction. I can recall with clearness and accuracy what I had for dinner yesterday, but what I ate a month ago to-day has passed beyond recall. There is an apparent exception in the case of extreme age. The old man recalls freely many of the events of his youth, but cannot remember the incidents of a year ago. This memory of early experiences is due to the impress made upon his brain in the plastic period of life; but the brain tissues have now lost the impressibility of youthful years; the power which we have called retention is atrophied, and reproduction is forestalled at its very source.

ASSOCIATION

A third, or we might say the first, condition of reproduction is found in what is called Association of ideas. *Association is that relationship between ideas by which they tend to recall one another into consciousness.* Our consciousness is always complex; that of any moment comprises many parts or items, and yet it is, in a sense, unitary. Whenever some of the items of a conscious state or instant are by any means revived, they tend to reinstate the remaining items, or constituents, of that conscious state. In brief, *experiences occurring together tend to recur together.* This is called the Law of Contiguity. But no instant of consciousness is distinct or cut off from the preceding and succeeding moments. Like dissolving views, the successive states blend into each other; so that we speak, appropriately, of the Stream of Consciousness. Yet the relation of ideas is not that of mere fluidity. Ideas are linked together by relations of time and space. The law of contiguity includes both these relations, and associates not only simultaneous ideas

but also those immediately successive. For example, if I have sometime fallen out of a boat at a picnic I shall hardly be able to recall the splash without images also of the surroundings, the witnesses, the preceding and succeeding events and demonstrations, the quest for dry clothes, etc. If I have once been at the top of the Washington monument, I cannot recall the fact without images of the Potomac, the Capitol and other contiguous facts and events. To recall the old homestead of childhood days is to image also its inmates and surroundings. For a simple example, how promptly each letter of the alphabet suggests the next! As the French proverb says, "You cannot think *a* without thinking *b*." The successive notes in a tune have the same power to call up each the next.

Law of Cause and Effect.—Another important relation which links ideas together is that of *cause and effect.* Consciousness of any fact or event as an effect tends forcibly to suggest the cause, and *vice versa.* The sight of a lime-kiln makes us look for the quarry; that of a water-mill, for the pond. Any visible action or gesture compels some interpretation on our part, some idea of the mental state which called it forth. The memory of a journey or of an accident will bring again to mind the causes which lay back of it. To think of a book is to think of its author or publisher.

Psychologists have been wont to include this association under the law of contiguity. But cause and effect are not always contiguous in either time or place; and the causal relation is so important a one in our mental life that it seems useful for the teacher to give it distinct recognition, whatever course the philosopher may find most consonant with his aims.

Law of Similarity.—A third principle of Association,

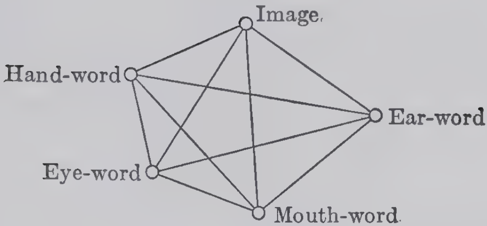
markedly distinct from either of the foregoing, is known as the Law of Similarity Ideas and mental situations tend to suggest, or recall, like past experiences. This likeness consists in the possession of a common element or elements. Thus the appearance of a person with a peculiar nose or eye may call to mind another person with a similar feature, though in other respects the persons may be widely different. To think of President Garfield is almost inevitably to think also of Lincoln and McKinley, because of their two elements of resemblance, one official and the other tragic. George Steele's poem, "Deirdre," which I recently read, reminded me of Tennyson's "Idylls of the King."

Law of Contrast.—The Law of Contrast has been recognized as a distinct principle; but it is not difficult to regard this as only a special form or variety of the law of similarity. Contrast is only a low degree of similarity. We do not contrast things which are wholly unlike; indeed, contrasted things have more points of likeness than of unlikeness. A dwarf may remind us of a giant, but both are men. Summer heat may suggest the cold of winter, or the cold of ice-water, but both are temperatures. Ingratitude may suggest gratitude, but both are moral qualities.

The Place of Association by Contiguity.—Association by contiguity is the predominant form with children and with uneducated persons, people of undeveloped intellects. The untrained mind cannot readily analyze a past experience and relate only the essential features of it. The associations of mere contiguity prevail overpoweringly at every step. Literature, which aims to mirror life, affords many examples, such as the maundering of Juliet's Nurse (Romeo and Juliet, Act I, Scene iii), or Dame Quickly's specific assault upon Falstaff:

"Thou didst swear to me upon a parcel-gilt goblet, sitting in my Dolphin-chamber, at the round table, by a sea-coal fire, upon Wednesday in Wheeson-week, when the Prince broke thy head for liking his father to a singing-man of Windsor,—thou didst swear to me then, as I was washing thy wound, to marry me, and make me my lady, thy wife. Canst thou deny it? Did not goodwife Keech, the butcher's wife, come in then, and call me gossip Quickly? coming in to borrow a mess of vinegar; telling us she had a good dish of prawns; whereby thou didst desire to eat some; whereby I told thee they were ill for a green wound? And didst thou not, when she was gone down stairs, desire me to be no more so familiar with such poor people; saying that ere long they should call me madam? And didst thou not kiss me, and bid me fetch thee thirty shillings? I put thee now to thy book-oath: deny it, if thou canst."

Association in Learning to Read.—Contiguous association enters largely into the routine work of the elementary school, as in learning the alphabet, learning to spell, learning the multiplication table, etc. In the process of learning to read, we have a striking example of the association of sensations. The child has first, let us say, the percept and image of a dog. The word *dog* comes to him first in sensations of sound, an ear-word. In learning to speak it, muscular sensations are associated with the auditory ones, and he has now a mouth-word. When the written symbol is presented, visual sensations enter the combination, and he has the eye-word. Finally, we have another set of muscular sensations aroused in the writing of it, giving him a hand-word. Henceforth, all these activities are indissolubly associated with the idea, or image, dog; and any one is able to call up all the rest. The annexed diagram represents, in a way, the part which association plays at each step in the child's conquest of a vocabulary.



The Higher Forms of Association.—But while association by contiguity plays so great a part in common life, the higher forms of intellectual activity are dependent on the associations of similarity and of cause and effect. The scientist, on the one hand, and the poet, on the other, live, so to speak, in associations of similarity. The botanist identifies his flower, the geologist his fossil, through the suggestive force of some point of likeness, and that, often, not through a laborious process of reasoning but by a flash of recognition. Whittier sings of a familiar sight:

> "Still sits the school-house by the road,
> A ragged beggar sunning."

We are struck at once by the force and fitness of the figure; but each and every metaphor springs into sudden existence through the suggestions of similarity, more or less subtle.

In all the studies of the school which are not purely mechanical, as in history, literature, and the sciences, it is the duty of the teacher to see that causal relations and those of similarity, or common nature, are brought to the fore and duly emphasized. The superficial and mechanical, often accidental, relations of mere contiguity have their part to play, but should be brought into service only where the more vital relations are not traceable.

Breadth of Association.—Since one great object of study and mental training is the power of ready recall, the ability to command a reproduction of what we have learned when we need it, the educator must consider carefully all the practical phases of association. One of these is found in the fact that readiness of recall depends on both *strength* and *breadth* of associations. Firmness of association is furthered by attention and repetition. Breadth of association is the result of definite, intelligent effort in the discovery and tracing out of relations, especially of similarity. The pupil should be trained to continually ask himself, in the face of any new item of knowledge, "Where have I met anything like this before? What facts already known to me have any bearing on this fact?" The more widely we associate any truth with other truths, or with its related facts, the more numerous and effective clues shall we possess for the recovery of this truth when wanted, through its convergent associations. We need to recognize, however, that associations are *divergent* as well as convergent. It is this fact of divergent association which leads to that mind-wandering which passes for inattention. The student needs to protect himself from this tendency by externally guarding against needless distractions and by exercise of will to keep his stream of consciousness flowing in the right channels.

Summary.—A percept is the notion we have of an object while it is acting upon our senses; an image is the idea which we have of an individual object or event which is not present to the senses. The percept is more vivid than the corresponding image.

Memory involves three factors, retention, reproduction, and recognition.

Retention is the permanent possibility of reviving past mental experiences; it is due to modification of brain structure. The conditions of retention are attention and repetition. Repetition deepens the brain "traces" produced by attention.

Reproduction is the act of recalling past percepts and images into present consciousness. It depends on retention, recency, and association.

Association is that relationship between ideas by which they tend to suggest, or recall, one another.

The most important principles of association are known as the laws of contiguity, of cause and effect, of similarity, and of contrast.

Association by contiguity is the main reliance of children and uneducated persons. Scientists and poets make greatest use of the law of similarity.

Breadth of association is essential to ready and effective recall; it can be secured only by diligent effort in tracing out relations between facts and ideas.

CHAPTER XVIII

MEMORY—*CONTINUED*

Recognition.—Recognition is an essential element of remembering. There may be retention and reproduction of past experience, but if it be not recognized as our *own* past experience, there is no memory. College seniors and more experienced orators, ere now, have had the experience of finding a place, in their effort of production, where composition became easy and expression ran smoothly if not eloquently. Later on, after delivery perhaps, the accusation of "cribbing" arose and was substantiated. The eloquent passage had been unconsciously reproduced from Macaulay, or some other admirable source, without recognition. The unlucky wight believed himself to have originated, not borrowed, the passage. This act of reproduction without recognition, in such cases, has received the name of "unconscious plagiarism."

The man who "repeats himself" is usually unconscious of the fact; he does not *remember* what he is repeating. It is a matter of cerebral habit rather than of memory.

The essential fact in the recognition of reproduced images seems to consist in the assignment to them of a definite time and place in one's own former consciousness. They must be known, at least, as representing actual former experiences of our own. As in perception, the mind must assign the perceived object a definite position in space, so in memory the revived event must be apprehended as having definite time relations to other conscious experience which we are also able to recall.

Kinds of Memory.—Attempts have been made to classify memory, or divide it into different kinds These attempts have not been very satisfactory; but it seems useful to recognize the differences between the memory of youth and that of maturity. In the years from, say, six to sixteen, memory is very receptive and tenacious. Mind is impressible and alert, the brain is very plastic, and even unimportant experiences are remembered without much effort of organization. The memory at this stage has been called *mechanical*, or *verbal*, words being easily remembered without much reference to their meaning. A declamation, for instance, of several pages of prose may be memorized with ease at this time; whereas, later in life such an act becomes, to most, an impossibility. This "tar-bucket" memory, which catches and holds all that it touches, relies mainly on associations of contiguity and relations of sensation. It remembers things by their sound or look and by simple succession, as in the learning by children of counting-out rhymes and other meaningless lingo.

After the age of about sixteen, this mechanical, verbal memory begins to fail, or rather to be superseded by what may be called the *rational*, *analytic* memory. Mere context becomes increasingly difficult to retain, by reason of changing brain conditions. Greater dependence must be had on the signification of what is learned; it must be analyzed and organized according to its relations of similarity and cause and effect. The law of contiguity is no longer an efficient servant, and verbal memorizing becomes a severe and irksome task.

Disparagement of Memory.—Much contempt has been poured upon the mechanical memory by educators in recent years. Indeed, all memorizing has been disparaged to such an extent, and all demand for "learning by

heart" has been abandoned to such a degree, that serious results have followed. A generation of pupils has arisen that blithely welcomes the new doctrine, and feels aggrieved at any requirement of accurate reproduction of lessons. This general disparagement of memory, directed in the first place against the ancient abuse of mere verbal memorizing, has now reached such a pitch in the unconscious practice of a generation of teachers that the *decay* of memory seems to be already a progressive result. The wise teacher will not pour scorn on that form of memory which is the distinctive and priceless possession of youth, but will strive, rather, to direct it and keep it alive as long as possible *along with* the more rational memory which arrives later. The premature abandonment of even severe exercise of the verbal memory is a pedagogical mistake. And we should take care, before it is too late, to store this memory with those useful facts with which it alone can cope. Learning to spell, for instance, is work for these years; it must be done then or never. So with the learning of arithmetical tables and dates in history, like 1492 and 1776, and the Latin paradigms. Again, youth is the time for storing the mind with a great quantity of literary extracts, "memory gems," as they are called in the parlance of teachers. In short, all the "drudge work" of memory should be taken care of before it is too late; for at the right time it is *not* drudgery. And even in the adolescent years we should not be neglectful of "learning by heart," though we should make the proper distinction between that and learning by *rote*.

Special Memories.—We sometimes speak of special memories, as the memory of musical sounds and combinations, of which "Blind Tom" furnished so striking an example; the memory of color and form, enabling an

artist to paint a portrait from memory; memories of dates, of mathematical formulæ, etc. But these are due to special interests or perhaps to special excellence in certain sense-organs, which results in greater depth of impression by special classes of phenomena. He who has no excellence of perception in a given class of phenomena will have no strength of memory in that direction.

Remembrance and Recollection.—Another classification, or division, of memory may be made on the basis of its relation to volition. Much of our mental recall is involuntary; one image follows another under the laws of association, the train of ideas being broken from time to time by new percepts which switch off the train upon new tracks, so to speak. This automatic recall, of which we have a good example in day-dreaming, may appropriately be named Remembrance. Recollection, on the other hand, is the term applied to recall by conscious effort of the will. Much of the student's effort in recitation is of this sort. A still more familiar example is found in the effort to recover a name which has "slipped our mind." This voluntary recall, like the automatic, depends on the principles of association, and works by seeking clues which may suggest the desired appellation. There seems to be lurking in consciousness a vague notion of the word, a sort of *mold* which it must fit. Various names come up and are tested by this mold and rejected, one after another, until one is found which fits and is accepted.

The training of memory consists not in modifying the power of "retention," which is undoubtedly a fixed quantity by constitutional organization, but in increasing the mind's skill (1) in organizing and relating the ideas to be reproduced, and (2) in searching for successful clues

and thus getting free from the obstructive force of divergent associations.

Mnemonics.—At certain periods in the history of education, much attention was given to Mnemonics, or artificial systems for aiding the memory. Some of these systems were very elaborate, as the famed "memory town" of the Romans, described in the Encyclopedia Britannica (9th edition). All mnemonic systems are based on the laws of association; but, as a rule, they employ only superficial and artificial associations. And the fact was at length appreciated that it costs more labor to learn and operate the systems than to remember without them.

Many simple mnemonic devices, however, are in common use, such as the familiar doggerel, "Thirty days hath September," and the artificial arrangement of initial letters as in the word *vibgyor* for the order of the prismatic colors, and divers schemes for remembering the signification of the various "signatures" of the musical staff.

Summary.—That experience which is retained and reproduced must also be recognized as belonging to our own past before the act of memory is complete.

We may distinguish between the *mechanical, verbal* memory of youth and the more *rational* memory of adult years. The one relies mainly on associations of contiguity; the other, upon relations of similarity and cause.

The early form of memory should be kept alive as long as possible, and not be disparaged or allowed to fall into disuse.

So-called special memories are due to special interests or the greater excellence of certain sense-organs.

Remembrance, or automatic memory, occurs through the mere succession of associated ideas or images; while recollection involves the exercise of will, and works by seeking for clues which may suggest the desired recall.

Mnemonics is a term applied to various devices and systems for artificially aiding the memory.

Memory.

- 1. Retention depends on depth of impression due to
  - 1. Attention depending on
    - 1. Brain Vigor.
    - 2. Stimulus
      - Quantity.
      - Quality.
      - Change of.
    - 3. Interest
      - Immediate, due to
        - Novelty.
        - Familiarity.
      - Remote.
  - 2. Repetition.
- 2. Reproduction depends on
  - 1. Retention (as above).
  - 2. Recency.
  - 3. Association
    - Law of Contiguity
      - Place
      - Time.
    - Law of Cause and Effect.
    - Law of Similarity.
    - Law of Contrast.
- 3. Recognition

CHAPTER XIX

IMAGINATION

The mental images which we have thus far considered, as furnished by memory, are remembered percepts, more or less exact copies of our own past experience. But the mind is able to transcend these limits and form images of experience not its own, of scenes remote in time and space. I have had a percept of Mount Tacoma, I may have memory-images of it at pleasure; but I may also form images of other mountains, of icebergs, and cathedrals,which I have not seen. This is beyond the power of memory, yet not without the aid of memory. I have never seen an iceberg, but I have seen ice, broken fragments of ice floating in water, and have noticed how large a part of their bulk lies below the surface of the water. I have seen blocks of ice subjected to the action of the sun and becoming white and honeycombed. I have sometimes seen the iridescent effects from such ice when the sunlight is reflected from it. And from these experiences I can construct the iceberg floating in southern seas. I combine with the various appearances of ice and water the size of a great building, for instance; and thus, from elements furnished first by perception and again by memory, I form an image of the unseen.

Again, one who has never seen a cathedral but has seen churches containing various elements of cathedral architecture may gather out those elements, under proper guidance, and recombine them into a new image. Thus,

he may start, mentally, with a stone wall of any building, adding the pointed arches of one church, the buttresses of another, the stained glass windows of another, the spires and pinnacles of yet others, the interior columns and arches from some picture, even, thus building, more or less completely, a cathedral in his mind. This is imagination, which may be defined as *the mind's power of reproducing and recombining into new forms the elements of past experience.*

The Process of Imagination.—The process above outlined is seen to be a sort of patchwork composition not altogether unlike that of our grandmothers, who cut up calico into various figures and stitched the pieces together again, according to some design, into the famous bedquilts of bygone days. The stages of the imaginative process are (1) Reproduction, the revival, in part at least, of images of past experience. (2) Dissociation, the breaking up of these memory-images and the selection of those elements needful for the new product. (3) Construction, the recombining of these elements, in due proportion, into a new whole, the image of something outside our own previous experience. This process is ordinarily guided by language as employed in descriptions, and may be greatly assisted by pictures in the imagining of visible objects; but in its higher forms imagination escapes from all leading strings and independently *creates* new images and combinations.

It is not to be understood that these three steps of the process of imagining are distinct in point of time; they coexist, or overlap. Indeed, we may be clearly conscious only of the final stage, construction. The image rises before us unbidden, often; but it can only arise out of materials of former experience retained and reproduced.

Phases or Kinds of Imagination.—Imagination has been divided into Reproductive and Constructive; but what is meant by reproductive imagination is simply memory, and only confusion results from calling it anything else. Moreover, all imagination is *both* reproductive and constructive.

A more valid distinction may be made between Passive and Active, or Automatic and Voluntary imagination. The first of these is seen in dreams, in day-dreaming, and in the uncontrolled fancy of children. Says Sully, "The sports of childish imagination are not the product of any mental [volitional?] effort, but seem rather to be the result of a 'fortuitous concourse of (imaginative) atoms.' Any kind of mental excitement, by greatly increasing the number of [memory] images called up, as well as their degree of vividness, is favorable to this free, uncontrolled play of imagination."

On the other hand, a more profitable exercise of imaginative faculty is accompanied by volitional effort, giving it direction towards serviceable and more or less intentional products. This may be found both in scientific speculation and in literary creation by novelist or poet.

The Uses of Imagination.—In time past, imagination has received, at the hands of some, a disparagement similar to that accorded of late to memory. It has been alleged that imagination is "like a peacock's tail," more ornamental than useful, more obstructive than profitable. It has been thought, too, to be a source of temptation and danger, morally speaking; and there is, of course, an element of truth in this view. "Vain imaginings" have always the possibility of moral danger; and imagination, like fire, is "a good servant but a bad master."

The office and service of imagination in our mental life may best be seen by an analysis into its more or less distinct uses.

Cognitive Imagination.—First, we may speak of the Cognitive Imagination, or imagination as employed in learning and knowing. In the field of geography, for instance, I have perceptive knowledge of those portions of the earth's surface which I have traveled over and personally seen. All the rest of the world I can know only by testimony; and that testimony can be made available only by the exercise of imagination, my own imagination. The facts of history, in like manner, lie beyond my immediate ken and can be reached and apprehended only by the imagination. So, also, in physiology our apprehension of the circulatory system, for instance, is to most persons merely such as imagination can construct. In geometry, such fundamental ideas as point and line are altogether imaginary; while astronomy furnishes an example of perhaps the most stupendous exercise of this all-embracing faculty. Perception has for its cognitive field only the present, a point of time; memory has a wider field, the past; but imagination sweeps past, present, and future. Like death, it "claims all seasons for its own." Let the pupil analyze carefully the work of a single day in each of his studies to discover the degree of his dependence on imagination in the knowing process, and he will doubtless be surprised at the result. Sense experience, though fundamental, as furnishing the raw materials of knowledge, is necessarily narrow and has relatively little value until taken up and recast by imagination, which gives our knowledge its widest extension.

Inventive, or Practical, Imagination.—But the doer as well as the thinker, the artisan as well as the student, finds constant need for the service of this faculty in what has been called the Practical, or Inventive, Imagination. The carpenter must have clearly in mind the final appearance and effect of the building or apparatus which he is

about to construct. He cannot build even a hencoop, except from actual copy, without forming beforehand an image of that which is to be. The cook making a batch of bread has, beforehand, her ideal of how it ought to look, outside and inside, when it is done. The dressmaker and milliner have, presumably, clear images of the effects which they aim to produce; though the uninitiated observer might sometimes suspect the results to be due to accident rather than to "malice aforethought." Even the farmer wishing to set a horse-post in his back yard, and selecting a stick from his wood-pile for that purpose, must exercise his imagination. He must have, beforehand, an image of the sort of stick needed, and even of the proper depth of the post-hole. Of course, the value of this phase of imagination to the machinist, the inventor, and the engineer is beyond computation. The end sought through the cognitive imagination is knowledge; that of the inventive imagination is utility.

Æsthetic, or Artistic, Imagination.—In contrast with these prosaic, cart-horse uses of imagination, we have—what many have thought of as its sole function—its use by painters, sculptors, and poets, the Æsthetic, or Artistic, Imagination. As the Cognitive imagination serves the ends of knowledge and the Inventive the ends of utility, so the Æsthetic has for its office to serve the ends of feeling, especially the *feeling for beauty.* This is the distinct field of the fine arts—painting, sculpture, music, literature, and architecture, not forgetting histrionic art.

The object of the artist is twofold, first to express and relieve the feeling aroused within him by his ideals and images; and, secondly, to arouse admiration and æsthetic feeling in the minds of others. The work of art pro-

duced with any lower aim than this is contemptuously called a "pot-boiler."

Only a few of us are artists, but all have in some measure the power of appreciating and enjoying true works of art, representations of ideal beauty, and this capacity deserves all possible stimulation and direction at the hands of teachers. As poetry is the highest of all the arts, rising farther than any other above the field of sense, and carrying the mind of him who comprehends it beyond the sordid limitations of daily life, be he rich or poor, it deserves the most earnest and judicious attention from all instructors of the young.

Ethical Imagination.—Still another field of imaginative exercise may be distinguished, that involved in our moral and spiritual development. This phase we may name the Ethical Imagination. Under this term, we place the mind's activity in setting up ideals of character. These are as truly constructive as any other products of imagination; they are built up by the regular process of dissociation and recombination. We admire the patience of one person, the integrity of another, the graciousness of a third, the courage of a fourth, and so on; and we gather up all these attributes into one ideal man, not neglecting, however, to retain some fragment, at least, of our own self as we conceive it.

Carrying this process still farther, we endeavor to form an absolute ideal, not of the perfect man, but of the perfect being, of absolute and infinite power and goodness; and so the ethical imagination leads us to our conceptions, more or less crude, of Deity, the Absolute One. Thus our religious feelings and ideals are woven together into our spiritual life.

Imagination and Emotion.—The intimate connection between imagination and emotion is a fact worthy of

notice. Imagination is a sort of border land where intellect and sensibility meet and mingle and interact. Imagination is most active when the feelings are excited; and the resulting images, in turn, still further excite the feelings. What is called the artistic temperament furnishes abundant illustration of this inherent connection between emotional activity and phantasy, or the image-making power.

"The poet's eye in a fine phrensy rolling" is supposed to indicate an inspired state; but everything that we mean by inspiration, whether religious or artistic, involves the possession of the mind by strong feeling, arousing the imagination to its highest flights. The prophet and the poet alike illustrate this interdependence of imagination and emotion.

But the same interdependence is found on a lower plane. The fears of children furnish an example, strong fear giving rise to phantoms which inspire fresh fear. A different example is found in the case of the young lover, whose intensity of tender emotion helps him to invest its object with graces and virtues not discoverable by other people.

Imagination in Children.—Evidences of imaginative activity are discoverable in children at an early age. Even in the first year of life, if the infant sees his mother putting on her wraps to go out, he will manifest signs of delight and expectation; and these have been cited as evidences of incipient imagination. It is doubtful whether they signify anything more than association of ideas; yet association is doubtless the starting point of all representation, of imagination as well as remembrance. In the second year, signs of the free exercise of imagination multiply in connection with the play of the child. A good example is seen in play with dolls, and especially with the

simple variety, or substitute, called paper dolls. A young child may form a collection of scores of these scissored bits of paper, each of which may not only receive its own permanent name but also a definite ascription of character and personality. A given one becomes consistently a good or bad, a sickly or quick-tempered child in all the many relations into which the little owner's active fancy may bring it. The conversion of a broomstick into a spirited or half-broken horse, which rears and plunges and endangers its rider, is a familiar phenomenon of the nursery. So with the construction of "play-houses," snow forts, and the like. All this play of childish imagination is admirably pictured in the following extract from Wordsworth's ode on "Intimations of Immortality from Recollections of Early Childhood."

"Behold the child among his new-born blisses—
A six years' darling of a pigmy size!
See, where 'mid work of his own hand he lies,
Fretted by sallies of his mother's kisses,
With light upon him from his father's eyes!
See, at his feet, some little plan or chart,
Some fragment from his dream of human life,
Shaped by himself with newly learned art—
A wedding or a festival, a mourning or a funeral—
And this hath now his heart,
And unto this he frames his song.
Then will he fit his tongue
To dialogues of business, love, or strife;
But it will not be long
Ere this be thrown aside,
And with new joy and pride
The little actor cons another part—
Filling from time to time his 'humorous stage'
With all the persons, down to palsied age,
That life brings with her in her equipage;
As if his whole vocation were endless imitation."

Crudity of Childish Fancy.—The imagination of childhood, while very active, is nevertheless crude and undeveloped. The child's lack of experience makes him credulous; he knows no reason why centaurs, mermaids, and dragons should not actually exist. Yet the higher exercises of the constructive faculty are beyond his reach. Through the quickness of his fancy, he is at the mercy of unwise nurse-maids and questionable associates in his most impressible years, and often he is left in such danger through the thoughtlessness or ignorance of parents. Thus the bugaboo stories, of the bogey, or the "black man," or "the goblins," sometimes told to children by servants as a means of frightening them into obedience or quiet, may lay the foundation for life-long fears and suffering.

Dangers of Imagination.—The dangers from maltreatment or neglect of childish imagination may be graded under several heads.

(1) *The confusion of fact and fancy.* A child of delicate nervous organization and sensitive nature may have its mind so filled up with exciting fairy stories—like Grimm's Tales, for instance—that the border line between reality and fancy becomes partially obliterated. What are called "children's lies" are often only the natural product of such conditions. They really have no moral quality, but are nevertheless a source of danger. Care and discrimination should be exercised here. Some children are too matter-of-fact and unimpressible to be in any danger from overstimulation of fancy; but others need to be carefully guarded and not left to revel riotously in exciting stories.

(2) At a later period, a worse danger arises in connection with the "dime novel" or "yellow" sort of literature, if literature it can be called, the danger of inciting *unreal*

views of life. The boy whose mind is saturated with such "rot" forms low and vulgar ideals, and naturally aspires to become, in fact, as well as in fancy, the Indian-killer, cowboy, or bandit of the yellow novel. As a matter of fact, thousands of boys have been thus corrupted and sent on a wrong track in life, through perverted imaginations, only to bring up in the reformatory or prison, if not at the rope's end. In like manner, many a girl, reveling not in the blood-and-thunder but the mush-and-honey type of cheap novel, forms the mental habit of looking forward to a life of idle luxury, and waiting inanely for the wealthy suitor, the princely lover, who shall carry her away from the limitations of real life to a land of dreams. She may end by becoming the slatternly, inefficient wife of whatever sort of man she can finally catch, or her end may be of a kind still worse, but unspeakable.

(3) To the person who is crossing the threshold of adult life, imagination becomes the servant of vice. "Vice is a monster of such hideous mien, that to be hated needs but to be seen," if seen in all its naked deformity. But it seldom is thus seen. Art is called to its service, and imagination casts a glamour over what would otherwise be repulsive. Meretricious literature, pictures, songs, and, worst of all, the exciting melodrama and vaudeville of the variety theater, all tend to gild licentiousness and lure the young man on to perilous indulgence and tampering with sin. The chambers of his mind, instead of being kept "beautiful, entire, and clean," come to be hung with impure images which take hold on the ways of death. *Impure images* are thus the latest and chief of the dangers which imagination, if not duly chastened and wisely nurtured, may lay in the path of the young.

Cultivation of Imagination.—The culture of the imagination is, therefore, a matter of the most vital impor-

tance, first, to make it the efficient servant of the intellect as the great expander of knowledge, and, secondly, that it may serve the life and character by the creation of pure and ennobling ideals. This culture may be both *positive* and *negative*. On the positive side, there must be (1) *a due provision of proper material*. To this end, the child should have great variety of sensation and of all wholesome experience. Children should be taken to parks and zoölogical gardens, to fairs and through industrial establishments, with such amount of general travel as may be practicable, that their stock of raw material for the uses of imaginative reconstruction may be as large as possible.

(2) Next comes *due exercise* of the constructive power. This is initiated, in the little child, by stories; later it is secured by narratives involving much description, such as are found in the Zigzag Journeys, Knox's "Boy Travelers," and similar books. History follows next, beginning with books of action, like Coffin's "Boys of '76," but coming in due time to Macaulay's England. Interest in literature should not be allowed to stop with the novel, but should be led on to an application and enjoyment of poetry—true poetry and not mere jingle. The Reading Class in the elementary school furnishes excellent occasion and means for the exercise of imagination in both its cognitive and æsthetic aspects.

(3) On the *negative* side, the work properly begins in the home, in the guarding of children against the forming and harboring of impure images. The damage is often done early. Long before parents have awakened to any sense of danger, the process of corruption may have got well under way, through the influence of evil-minded associates, unthinking servants, and unscrupulous advertising quacks. But in school also there is need for vigilance. One evil-minded boy in a large school may prove a

center of debasement and demonstrate anew that "one sinner destroyeth much good." The teacher should never forget that imaginative power may minister to the highest interests of the human soul or it may lay snares to trap it into all that is vile and debasing.

Summary.—Our image-making power is not confined to the present, but may reach through all time and space. Imagination pictures the as yet unseen by reproducing and recombining the elements of past experience.

The process of imagination includes three steps, Reproduction, Dissociation, and Construction.

It may be distinguished as Automatic and Voluntary.

It may also be denominated, according to its uses, as (1) Cognitive, as employed in learning and knowing; (2) Inventive, or practical, as used in doing or making; (3) Æsthetic, or artistic, as serving the ends of feeling; and (4) Ethical, as involved in our moral and spiritual development.

Imagination is intimately connected with emotion; it is the border land of intellect and sensibility.

Imagination appears early in children, especially in connection with the play instinct. It is then active, but not highly developed, taking the simple and crude forms of childish fancy.

Certain dangers from the misdirection of childish imagination are (1) Confusion of fact and fancy, (2) Unreal views of life, (3) Impure imaginings.

The cultivation of imagination involves (1) A due provision of proper materials, (2) Due exercise of the constructive power, (3) The proper guarding of children against the forming of impure images.

CHAPTER XX

CONCEPTION

The Thought Powers.—We have thus far considered only those impressions and effects which are produced by individual objects and events, and the mind's reaction upon them as individuals. We have studied the Presentative Power of the mind, Perception, and the Representative Powers, Memory and Imagination, all of which yield only the individual notion. We come now to the general notion and those mental operations which are included under the term Thought. The so-called Thought Powers are distinguished as Conception, Judgment, and Reasoning. These operations are closely interrelated; but, logically, that of conception is fundamental and must be first comprehended.

The process called conception results in mental products, or ideas, called concepts. It will be useful for us to gain, at the outset, a clear understanding of the proper application of this term, since it has been so loosely used in pedagogical literature that the reader is often confused by its ambiguity. By some, it has been employed to denote almost any state or form of consciousness, a use for which the term *psychosis* would be better fitted. Let us proceed to illustrate the correct use of the term.

Concepts.—Let the reader try to have in consciousness all that is ever meant by the word *soldier;* not the image of an individual soldier but the idea of soldiers in general. At the first sight or sound of the word, there will doubt-

less come into mind the image of a man in uniform of some particular color and armed with weapons of some particular style. He may be imaged as either on foot or on horseback. But while the word *soldier* may stand for such an individual, it also has a much wider application. Soldier may mean either cavalryman, infantryman, or artilleryman; spearman, bowman, or musketeer; clad in any style or color of uniform according to nationality; of varying age, size, or even sex, so broadly inclusive is the term. And yet it is also exclusive, for certain definite attributes, or qualities, are essential to every soldier. Let us say, soldiers are all persons trained and organized to fight in the service of a nation. This general notion of a class of persons or things is called a concept, or, still more accurately, a *class concept*. All class concepts are represented in language by common nouns.

The Process of Conception.—The process of conception may be analyzed into four steps or stages. (1) Comparison, or the discerning of the likeness and unlikeness of a number of percepts or images. This, of course, implies presentation, or perception, as an antecedent process. (2) The mind skims off, so to speak, or separates out for closer attention, those attributes, or qualities, which are discerned to be *common* to all the individuals compared. This drawing off of the common qualities and rejection of all others, no matter how striking or conspicuous, is called Abstraction. (3) But the common qualities are abstracted for a purpose. The next step is that of grouping together in mind all individuals which possess these qualities in common, or the formation of *classes* on the basis of common attributes. This act is called Generalization, the word being derived from *genera*, the plural of the Latin word *genus*, meaning a class. (4) But the process is not yet complete. The notion of a class,

thus reached, is incommunicable and unmanageable until it has been marked off by a name common to all the class, a common noun. This step is called Denomination. The essentiality of this step to the complete process of conception will be more fully considered in a future chapter.

Illustration of the Growth of a Concept.—The rise of concepts in the mind of a child may be illustrated by the following example. Suppose a child in country or village to be familiar with a large building adjacent to the dwelling but devoted to different uses. In it are horses and other animals, with their fodder and perhaps sundry vehicles. Moreover, this place seems well suited to the play of the child and his mates. So long as this is the *only* building of the sort which he knows, he has only percepts or images of it, and the word *barn* is a proper noun. His idea of barn is only an individual notion. But, in time, he visits neighboring premises and finds there buildings devoted to similar uses, though differing in many particulars, as color, size, and material. The child compares them, abstracts the common qualities—home for domestic animals, storehouse for their food, place for boys to play in—generalizes all such buildings into a class, and extends to them all the term barn, which now becomes a common noun.

Abstract Notions.—We are now prepared for a further step in clearing up our idea of what concepts are. Some concepts are not class concepts. The process of abstraction may be carried so far as to eliminate all the qualities of the compared objects except one, and then we may apply a name to that quality as such, without any reference to the individual objects possessing it. Thus we designate single, abstract (abstracted) qualities by such words as *height*, *weight*, *hardness*, *goodness*, *truth*, *temperance*, and the like. These we appropriately call

abstract nouns, and the ideas which they represent are called *abstract notions.* We thus have two kinds of concepts, (1) class concepts, represented by common nouns, and (2) abstract notions, represented by abstract nouns. The old grammar-book definition, "An abstract noun is the name of a quality considered apart from the thing to which it belongs," is pertinent in this connection. If a definition is demanded for concepts as a whole, we may simply say, *A concept is a general notion.*

Of course, these abstract qualities are not distinct things possessed by objects; they are, in fact, only effects produced on our minds by classes of objects. They are, in a sense, simply influences which objects exert; that is what we mean by qualities.

Concepts Cannot be Imaged. — Because of its generality, a concept cannot be imaged. An image is always individual, a concept is general. Let us take another example of the way in which concepts are formed, by trying to abstract the essential common qualities of the concept *tree.* If we say that a tree must have a trunk, we still cannot specify any given length or diameter. Its length may be one inch or a hundred feet. If we say that leaves are essential to a tree, we cannot assign any particular form; and the tree may be either deciduous or evergreen. We agree that roots are essential to all trees, but of what length or spread? A tree must have sap circulating through its parts, but that can hardly be imaged. If we now try to gather up only these essential characteristics, we have no more than the ghost of a tree. Though roots, sap, etc., are very real, they are not picturable in general but only in particular.

It is doubtless true, with most minds at least, that the hearing or sight of a common noun usually calls into consciousness the image of some possible individual of the

class; but this preliminary image is only a forerunner and not the concept. It may well be called a "symbolic image," but it should be clearly distinguished from the class concept which it symbolizes.

As in perception we must distinguish between the percept and the perceived object, so in conception we must not confuse the concept with the body of individuals from which it is derived. For example, if we had all the elephants in the world gathered into one enclosure, they would not constitute the concept *elephant*. The concept is purely a mental creation.

Concepts Not Fixed or Uniform in Content.—We must carefully guard against thinking of concepts as definite and permanent products with constant values. The concept of *virtue*, or even the concept *plant*, for instance, is not the same in different minds nor in the same mind at different times or ages. A concept is, it has been said, "a bundle of qualities." But it does not always contain the same qualities. A concept is "a way of looking at things," "the way things go together"; as in the concept *triangle*, which does not simply represent a class of facts, but a way of thinking lines together.

Concepts are always in the process of growth. The child's idea of *animal* is at first crude and fragmentary. It lacks intension, since he has not abstracted all the essential attributes; and it also lacks extension, inasmuch as he does not consciously include all the constituent species. He does not yet realize that worms or mosquitoes are animals. Children's concepts are little more than shells, which must be gradually filled with meaning as the growth of experience and reflection make such development possible. The ordinary person's concept of *orange* is very different from that of the botanist, the artist, or the chemist. The concept may be conceived, then, as a

living, growing mental entity, and not simply as an intellectual coin which is legal tender in all markets.

Relations of Concepts: Genus and Species.—Class concepts as such have certain properties and relations, a clear apprehension of which is very important to the educator. Of these relations, the first to be considered is that of Genus and Species. If, in several kindred concepts, as *corn*, *wheat*, *rice*, we should carry the process of abstraction still farther and discard some of the specific attributes of each, we could combine them all into one larger class called *cereals*. This new class is *genus* to all the others which it includes, while each of them is *species* to the genus.

A genus is a class which may be divided into smaller classes called species.

A species is one of the classes formed by the division of a genus.

This division or separation is effected by the addition of one or more essential attributes in the case of each species. Thus, to the essential qualities of *cereal*, in the example above, we add, to form the concept *corn*, that particular quality which distinguishes it from all other grains. This attribute is called its *specific difference.* Thus the word *cart* represents a species of the genus *vehicle;* its specific difference being "two-wheeled," which marks off all carts from other vehicles. The number of species which can be formed from any concept taken as genus is limited only by the number of distinctive attributes, or *differentiæ*, which may be abstracted and added, in turn, to the essential attributes of the genus.

While concepts may thus be said to include others as their species, they do not bear to each other the relation of *whole and part.* That is a relation existing only between individuals. A particular limb is a part of a

tree; but the concept limb is not a part of the concept tree; it represents all limbs of all trees. Mexico is a part of North America, both being individuals.

Intension and Extension.—Every class concept may be considered from two points of view, (1) That of the common attributes which inhere in it and constitute its *meaning*, (2) That of the number of individuals comprised under it, in the class which it represents. This latter aspect constitutes what is called the Extension, or Denotation, of the concept. The first named aspect constitutes the Intension, or Connotation, of the concept. Together they constitute the *breadth* and *depth* of the idea. Thus, if we compare the concepts animal and vertebrate we shall see that animal comprises a greater number of individuals than vertebrate; it has greater extension. On the other hand, vertebrate has at least one distinctive quality, backbone, which is not possessed by all animals. Vertebrate has, therefore, greater intension than animal.

Extension is that aspect or attribute of concepts which has reference to the number of individuals comprised. Intension is that aspect of concepts which relates to the essential attributes of the concept. The intension of a concept is, in a sense, its significance, or meaning.

The broadest or most extensive of all concepts, called by logicians the *summum genus*, is that of *being* (thing), which has but one attribute, that of *existence*, for which reason it comprises an infinite number of individuals. It has the maximum of extension and the minimum of intension. This inverse ratio of extension to intension prevails with all concepts; every addition of a required attribute cuts down the number of individuals possessing all the requirements. Whereas, the removal of any attribute as essential enlarges at once the bounds of the concept.

Concepts in Series.—This connection of concepts with one another in series, under the relation of genus and species, is exhibited in the following outline:

	Concepts.	Attributes.
Summum Genus—Being—Existence.		
Subaltern Genera.	Matter	Existence+weight, etc.
	Organic Matter	Existence+weight+life.
	Animal	Existence+weight+life + motion, etc.
	Vertebrate	Existence+weight+life + motion + backbone.
	Mammal	Existence+weight+life + motion + backbone+suckling.
	Man	Existence+weight+life + motion + backbone+suckling+language.
	Caucasian	Existence+weight+life + motion + backbone+suckling+language+white, etc.
	Teuton, etc.	
	* * * * * * * *	

Infima Species, the smallest possible class of men of the Teutonic genus. Individual, Bismarck.

The *summum genus* has only one attribute, but infinite extension. The individual (which is not a concept) has its extension numerically expressed by one, but has an indefinite number of attributes; its intension is great. Each of the subaltern genera is genus to all below it in the series, but is species to all above it. The *summum genus* can never be species; and the *infima species* can never be genus, being incapable of division into smaller classes.

This logical relation of genus and species between class concepts is one of the utmost importance, lying at the bottom of all scientific classification and essential to all intelligent comprehension of the universe.

Summary.—In distinction from the presentative and representative powers which yield only individual notions, Conception, Judgment, and Reasoning are known as the Thought Powers. These have to do with general notions and the relations between them.

Conception is the process of which concepts are the product.

Concepts are general notions, or ideas, of which we distinguish two kinds, class concepts and abstract notions.

Class concepts are represented in language by common nouns; abstract notions, by abstract nouns.

The process of conception comprises four steps. viz., Comparison, Abstraction, Generalization, and Denomination.

Abstraction is the separating off, for closer attention, of the common qualities of individual objects.

Generalization is the grouping into classes of objects on the basis of common qualities.

Abstract notions are our ideas of single qualities considered apart from the objects to which they belong.

Concepts are not fixed or constant products, but are always in the process of growth.

Class concepts bear to each other the relation of genus and species. A genus is a class which may be divided into smaller classes called species; a species is one of the smaller classes formed by the subdivision of a genus.

Concepts have the attributes of Extension and Intension. Extension has reference to the number of individuals comprised; intension to the essential attributes of the concept.

CHAPTER XXI

DEFINITION AND DIVISION

Definition.—There are two ways by which the application of a general term may be unfolded, (1) Through its Intension, (2) By reference to its Extension. An accurate setting forth of the essential attributes of a concept is called Definition. A definition is a statement of the intension of a concept; hence definition pertains only to concepts, or general notions. We *describe* individuals; we *define* concepts. As its etymology indicates (from *fines*, boundaries), the purpose of definition is both inclusive and exclusive. A proper definition shuts out from the class all individuals which do not belong to it and includes all that do, like a pasture fence. It need hardly be said, however, that much which passes as definition is very loose and inadequate.

The Structure of a Definition.—Since a complete enumeration of all the attributes of a given concept would often be laborious and tedious, we economize time and effort by the device of first naming the proximate genus of the concept under definition and then adding its specific difference, or differentia; namely, the quality or qualities which differentiate it from other species of that genus. Thus we define *chair* as "a movable seat" (genus), and proceed to add its differentia, "with a back and designed for one person."

Definition is a difficult process, and its difficulty lies in the accurate performance of the act of abstraction, in

determining precisely what are the *essential* common qualities of the concept defined. For the same reason, it is a valuable exercise, when properly directed, as a discipline in analysis and exact thinking. But the mere "parroting" of definitions, learning them by rote without clear comprehension of their exact force and application, may prove an illusory and injurious labor.

All framing of exact, scientific definitions involves a careful adherence to the following

Rules of Definition.—(1) A definition should comprise all and only the essential attributes of the concept defined.

(2) It should not contain the term defined nor any of its derivatives.

(3) It should not be expressed in obscure, ambiguous, or figurative language.

(4) It should not be negative in form when it can be affirmative.

It will be noted, however, that some words are merely negations, being formed from others by the use of a negative prefix, as *unsound*, *nonessential*, etc. A caution needs to be given also against the use of what might be called "double-barreled" definitions. For instance, the old grammar-books defined *verb* as "a word used to denote being, action, or state." Here is a thoroughly ambiguous statement, applying to no one class of words but to three. The process of abstraction was not carried to the point of determining the one essential attribute of all verbs, namely, the power, or function, of asserting. Nouns may "denote action, being, or state" as truly as verbs. Such ambiguous and confusing definitions work serious harm in the minds of young learners.

Exercise in Applying the Rules of Definition.—Let the pupil now determine which of the above rules are violated by the following attempts at definition, viz.:

"Sunday is the golden clasp that binds the volume of the week."

"Life is the act of living."

"Life is the sum of all the vital functions."

"Words are the articulate signs by which an orator expresses his ideas."

"Words are signs of ideas."

"Evil is that which is not good."

"Deity is the circle whose center is everywhere and whose circumference is nowhere."

It will be observed that they are correct in form or structure.

Let the class now make a careful effort to frame true definitions for the following words, observing the rules above given: *chaise*, *watch*, *oak*, *horse*, *string*, *arithmetic*, *book*, *church*, *adjective*, and others.

Logical Division.—A second mode of unfolding the application of general terms is that by reference to their extension. For instance, a young child hearing the word *animal* will demand to know its application. The method of definition, involving the use of abstract terms, is not adapted to the infantile stage of development, and cannot be successfully employed. We may point the child to various individual animals, saying, "*That* is an animal, and *that* is an animal," and so on. This method, by particular instances, will serve a temporary purpose excellently; but, of course, it can never attain completeness of result.

With a child a little older, instead of pointing out individuals, we may abridge the process by citing familiar species of animal, thus, "Dogs are animals, cats are animals, chickens are animals," and so on. This method, the opposite of definition, is called *Division*, or more definitely, Logical Division. "*Logical Division is the*

enumeration of the constituent species of a proximate genus." The sign of this kind of division is the brace, $\{$. Division is an essential factor in all the classifications and systemizations of the natural sciences. The most elaborate and complete instance of it, perhaps, is found in the Botanical "Key."

Certain rules which must be observed in division are as follows:

Rules for Division.—(1) The constituent species must exclude each other (must not overlap).

(2) The division must be made, throughout, on one basis or principle.

(3) The species, taken together, must equal the genus divided.

Let the pupil now divide the concepts *man*, *triangle*, *leaf*, etc., paying due heed to the rules above given.

Summary.—The application of a general term may be unfolded by reference to its intension or its extension. The first method is called definition; the latter, division.

A definition is a statement of the intension of a concept.

In constructing a definition, we first state the genus under which the concept belongs and then its specific difference There are four rules which must be observed in all exact definition.

Logical division is the enumeration of the constituent species of a proximate genus. Certain definite rules must also be observed in the division of a genus into species.

CHAPTER XXII

JUDGMENT

What we Mean by Judgment.—Concepts arise, as we have seen, from the comparison, analysis, and generalization of images and percepts. Next in order of complexity among mental operations, we come to the comparison of ideas and discernment of their relations. *The mental affirmation of agreement or disagreement between ideas is called a judgment.* The term Judgment is also applied to the power and the act of making such mental affirmations; it is the second stage in Thinking. The language in which a judgment is expressed is called a proposition, or a (simple) sentence. Judgments are thoughts; they bear the same relation to ideas that sentences do to words. "A word is the sign of an idea"; "A sentence is a thought expressed in words," we are told in the grammar-book.

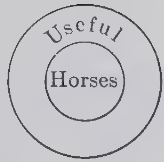
The forming of a judgment seems, at first thought, a simple matter, just the yoking of ideas together in pairs; but, in fact, it proves to be the supreme effort of the mind. All other mental processes exist in order that we may form judgments. And the validity of our judgments depends upon the clearness and soundness with which we discern the true relations of ideas.

The Essential Parts, or Elements, of a Judgment.—The essential parts, or elements, of a proposition, are three, the *subject*, *predicate*, and *copula*. The copula, as the name implies, is the coupling or connecting word, whose office is to assert the relation between subject and predicate. In many—perhaps the majority—of propositions, however, the copula and predicate are merged into one word—"telescoped," as it were. Thus, instead of saying "Fishes are swimmers," we say "Fishes swim." When the copula is separately expressed, it is the verb, or asserting word of the sentence; and the predicate word is always a noun or an adjective, as in "Crows are cunning," "Whales are mammals." But when copula and predicate are combined in one word, that word is a verb, as in "Dogs growl." The copula is either some form of the verb *to be* or of words which assert some hypothetical mode of existence, as *seem*, *appear*, *feel*, *look*, *sound*, *taste*, *smell*. "It seems heavy" means it *is* heavy to appearance; "It tastes good" means it *is* good to the taste. The subject of a proposition is always a substantive.

Nature of the Predicate Idea.—The subject idea may be either a percept, image, or concept; but, in general, the predicate idea must be a concept, as in "This dog is a collie," "The dog we saw yesterday is a spaniel," "All dogs are vertebrates." The predicate, moreover, is always, whether represented by noun or adjective, a more extensive, or broader, idea than the subject; it *includes* the subject, as in the examples given above. Thinking has been defined as "subsuming subjects under predicates," and this definition at least emphasizes a thought of importance from the pedagogical standpoint. This general relation of subject to predicate has been well exhibited by what is known as Euler's Notation, in which circles are employed to indicate the relative extension.

Sugar is sweet.

Horses are useful.



Birds fly.

An important exception must be noted, however, to the rule that the predicate includes the subject. In such judgments as "That boy's name is John," "Two times two are four," "A right line is a straight line," "*Mercator* means merchant," the subject and predicate coincide, or have exactly the same extension. These may be called judgments of identity. In mathematics, they are called equations.

Classification of Judgments.—Judgments are divided into classes on several bases, or principles, namely,

(1) According to Quality $\left\{\begin{array}{l}\text{Affirmative.}\\ \text{Negative.}\end{array}\right.$

A negative judgment affirms disagreement instead of agreement between the ideas compared, as "Some roses are not fragrant."

(2) According to Quantity $\left\{\begin{array}{l}\text{Singular.}\\ \text{Particular.}\\ \text{Universal, or General.}\end{array}\right.$

By quantity is meant the quantity, or extension, of the subject.

A Singular judgment is one whose subject is a single individual, as "Theodore Roosevelt is president," "That boy threw the stone."

A General, or Universal, judgment is one whose subject is a whole class, an unbroken concept, as "Horses eat grass," "All men are mortal," "No man desires pain."

A Particular judgment is one whose subject is some part of a class, a broken concept, as "Some days are stormy," "Some fishes have no scales," "Most men love money."

This classification of judgments is of more importance to the teacher than any other, through its relation to method.

(3) According to Origin $\begin{cases} \text{Direct, Immediate, Intuitive.} \\ \text{Indirect, Mediate, Reasoned.} \end{cases}$

A Direct, or Intuitive, judgment, as its name implies, is one which is arrived at instantly, without any labored process of deliberation or reasoning, as "This day is cold," "I am hungry," "Things equal to the same thing are equal to each other."

A Mediate, or Reasoned, judgment is one which is derived from other judgments by a process of comparison and reasoning, as "Eggs will be dear next January," "Ice is a mineral substance," "All particles of matter attract each other."

The word *intuitive* is derived from the Latin *intueor*, to behold directly. Intuition thus means a direct beholding. Intuitions have been distinguished as (1) Sense Intuitions, or perceptive judgments. (2) Rational Intuitions, axioms, as "The whole is equal to the sum of all its parts." (3) Moral Intuitions, as the universal apprehension of moral distinction between acts, the conviction that there is a right and a wrong in human conduct.

Logicians have also classified judgments as Analytic and Synthetic; but this distinction has no pedagogical value, amounting only to a distinction between old and

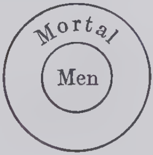
new judgments. The same judgment may thus be analytic to one mind and synthetic to another.

Again, judgments may be classified as Categorical and Hypothetical. A categorical judgment is one that is affirmed unconditionally; it is definite and unqualified, as "Freedom is a necessary condition of well-being." A hypothetical judgment is one that affirms a relation conditionally, as "If a man is free, he should be happy."

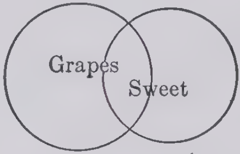
An Exercise in Classification of Judgments.—In order to impress and clarify the distinctions recognized in the last lesson, let the pupil classify according to each of the three specified bases, or principles, the following judgments, viz.:

1. Some violets are not odorous.
2. Unsupported bodies fall to the earth.
3. No seaweed is a flowering plant.
4. This day is cold.
5. Material bodies have weight.
6. The moon shines by borrowed light.
7. Dynamite is dangerous.
8. Boys are often lazy.
9. Some men are ruined by riches.
10. The proper study of mankind is man.

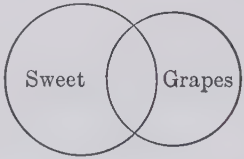
Euler's Notation further Illustrated.—We may now profitably make some further exemplification of Euler's Notation as applied to different kinds of judgments. In general judgments, as already seen, the subject circle lies wholly within the predicate circle, as in "All men are mortal."



With particular judgments the circles will intersect, as in "Some grapes are sweet."

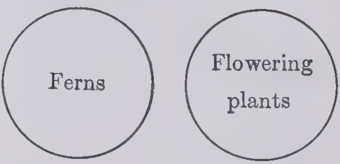


The same diagram will fit the negative judgment, "Some grapes are not sweet."



With universal negative judgments, however, the circles will exclude each other, as in

"Ferns are not flowering plants."



In judgments of identity the circles will coincide, as in

"Quadrupeds are four-footed."

In singular judgments the subject would be represented by a point instead of a circle, as in

"Bismarck was a statesman."

Indistinct Judgments; their Causes.—The value of a judgment depends mainly upon its clearness. The bane of human thinking is not so much mistaken as vague and confused judgments; and this is nowhere truer than in the work of the schools. Education has been a failure with thousands of youths because they have not attained to clear judgments at each step in the subjects which they were supposed to be learning.

The causes of indistinct judgment should be clearly recognized, that they may be duly guarded against. They are:

(1) Imperfect Perception, as when one wrongly judges the height of a silk hat, the length of a horse's head, the circumference of a tree, or the width of a wagon track.

(2) Imperfect or Fading Memory, as when one mistakes concerning the facts of his past experience or of history.

(3) Imperfect Conception, which is the most pervasive and insurmountable obstacle to clear judgment. For illustration, place before the pupil such judgments as "Arson is venial," "Penuriousness is a vice," and ask him to take a positive stand, with reasons, as to their truth. If he has not clear concepts for both subject and predicate, he is not qualified to form any clear judgment as to their relation, and will so confess.

(4) The Intrusion of Feeling. An angry man's judgment is proverbially valueless. Men in a burning building do the most irrational things in their excitement. Our judgment as to future events is colored by our intense desires. We talk of our judgment as *cool*, *calm*, when we

wish to command confidence in it. When feelings are habitual, chronic, so to speak, we suffer from the bias of judgment known as *prejudice.*

(5) Taking Judgments at second-hand. This is illustrated in the political and religious judgments of most young people, to say nothing of older ones. The opinions of parents are apt to be adopted without question and without clear comprehension. The books and newspapers of the home add to this effect, since they naturally harmonize with the parental beliefs. But a more serious effect of this cause is found in the work of the schoolroom. The hazy, unusable body of indistinct judgments which the average pupil carries away from the school are the natural result of so much text-book work, with its acceptance of second-hand judgments on authority and so little efficient use of his own powers of observation.

Relation of Judgment to Other Mental Processes.—While, from the standpoint of the logician, judgment is rated as one of the higher powers of the mind, ranking above memory, imagination, and conception, the psychologist finds it parallel with and indeed entering into all the other activities. Thus in the act of perception, which consists in the interpretation of sensations, we found *inference* to be one of the steps in the process. We *judge* the given sensation to be due to a certain cause, as when we refer a given sound to a steam whistle rather than to the milkman's horn. The act of inference in such a case is not necessarily a formal judgment, with its terms distinctly expressed. It is implicit rather than explicit, a judgment folded in the bud rather than in full bloom. So also in memory, there is an implicit, rudimentary judgment of identity, of recognition; and in creative imagination there is a judgment of fitness, the fitness of dissociated elements to enter into the new combination.

Relation of Judgment to Conception.—While judgment, in one sense, is based on conception and consists in the relating of concepts, it is, on the other hand, an essential part of the act of concept-forming. Reciprocity is the law of their action. Each process is dependent on the other; no judgments without concepts, no concepts without judgment. The question of which comes first, conception or judgment, is much like the old puzzle, "Which was first, the chicken or the egg?" a question which has found its answer in the theory of evolution. Perception, conception, and judgment mount together in a spiral course.

The great difficulty which most obstructs clear judgment is the difficulty of close and accurate analysis, the difficulty of accurate abstraction. For such analysis is the vital thing in clear conception, and consequently in correct judgment. But this analysis, again, is only one form of critical judgment.

Summary.—The mental affirmation of agreement or disagreement between ideas is called a judgment. The term is also applied to the mind's power to make such affirmations.

The essential parts of a judgment are the subject, predicate, and copula, but predicate and copula are often combined in one.

In general, the predicate idea is a concept and includes the subject, except in equations, or judgments of identity.

Judgments are divided on different bases, as quality, quantity, origin, etc. The most important distinction to the teacher is that between particular and general judgments.

The bane of human thinking is found in vague, indistinct judgments. The causes of indistinct judgments are, (1) Imperfect perception, (2) Fading memory, (3) Imperfect conception, (4) Intrusion of feeling, and (5) Taking judgments at second-hand.

Judgment enters into all the other activities of mind, being involved implicitly in perception and memory as well as imagination and conception. Perception, conception, and judgment rise together by mental interaction.

CHAPTER XXIII

REASONING

Reasoning.—In the preceding chapter, we observed that while some judgments are formed with apparent directness, or immediacy, others are arrived at through a process of analysis and inference. This process of deriving new judgments from those previously accepted is called Reasoning.

As judgment involves a comparison of concepts, so reasoning involves a comparison or relating of judgments. It is thus, in point of complexity and elaboration, the highest of the mental processes.

The unit of reasoning, the single process by which a new judgment is reached, is called an *argument*, and the resulting judgment the *conclusion.*

The Syllogism.—The simplest form of argument, so far as ease of explanation is concerned, is called the Syllogism. It comprises three judgments, the conclusion and two others called *premises*, as,

> All explosives are dangerous.
> Dynamite is an explosive.
> Therefore, dynamite is dangerous.

It will be noticed that this syllogism contains but three ideas, or concepts, which are called its terms. The one of these having the greatest extension is "dangerous," which is therefore called the *major term.* The one having least extension is "dynamite," the *minor term.* The other concept, "explosives," midway between the others

in point of breadth, or extension, is appropriately called the *middle term.* The premise containing the major term is called the *major premise;* the one containing the minor term, the *minor premise.* It will be noted that the middle term appears in both premises, but not in the conclusion. It serves as a sort of yardstick, or standard, with which the major and minor terms are successively compared.

While it may seem the natural order of propositions to state the major premise first and the conclusion last, this order of arrangement is not essential. The three propositions may be stated in any order by varying the connective, thus,

> Methuselah is mortal
> Because Methuselah is a man,
> And all men are mortal.

Indeed, in practice, it is common to first announce the conclusion as a proposition to be proved, or established. There are many forms or "modes" of the syllogism; but the consideration of these belongs to formal Logic.

(*Let the pupils be practiced here in the construction of syllogisms.*)

Essential Characteristics of Deductive Reasoning.—The foundation of the syllogistic argument lies in the major premise, which is always a broad, general judgment, or proposition. The minor premise may be either a general, a particular, or a singular judgment; but, in any case, it must be *less* general than the major premise. The same is true of the conclusion. It is thus said that syllogistic reasoning proceeds from the general to the particular; and this is its essential characteristic. As the conclusion is involved in the major premise, and is deduced, or drawn, from it by aid of the middle term, this mode of argument is also called Deductive Reasoning.

The Dangers of Deductive Reasoning.—The conclusiveness of deductive argument depends, in the first place, on the truth of the premises. True conclusions cannot be derived from untrue premises. It depends, in the second place, on the correctness or legitimacy of the reasoning process. Logicians have developed many formal rules governing this process. Different forms of, or liabilities to, error arising from neglect of these rules are called *fallacies*. We can note here only one of these, "the fallacy of the undistributed middle," of which the following is the classic example:

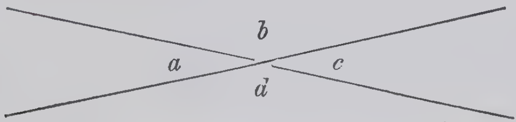
> The wise are good.
> Some ignorant people are good.
> Therefore, some ignorant people are wise.

This, as it stands, is a syllogism only in form; because the middle term, "good," is not distributed, or taken in a universal sense, it being one of the laws of the syllogism that the middle term must be thus taken in at least one of the premises. If we obey this, by placing the word "all" or "the only" before "good" in the major premise, the syllogism becomes a valid one, and its conclusion true if the premise is true.

We have in the above also an illustration of the mischief of ambiguity in the use of terms. Thus the word "wise" may be taken in either of two senses, its true sense or that of *learned*. If the wise were only the learned, then the major premise would be untrue and the minor premise nonsense. Whereas, if "wise" be taken in its proper signification and the middle term be duly "distributed," we have a valid argument and a true conclusion. Doubtless half of all the failure among disputants to reach common conclusions is due to ambiguity, or the use of the same terms in different senses, consciously or unconsciously.

Demonstrative Reasoning. — Mathematical reasoning, because of the absolute conclusiveness of its results, is also called Demonstrative Reasoning. It is wholly of the deductive type, proceeding "from the general to the particular." This is best exemplified in geometrical reasoning, which starts from broad generalizations, as definitions and axioms, and in its progress descends to narrower and narrower propositions or theorems. But even in the earliest and simplest theorems the demonstration involves the use of several syllogisms. Take, for example, the theorem:

"If two straight lines intersect, the vertical angles are equal."



The conclusion to be reached is that $\angle a$ is equal to $\angle c$.

Syllogism 1
- $\angle a$ is equal to $\angle c$, *because*
- $\angle a + \angle b$ is equal to $\angle b + \angle c$, and
- Equals from equals leave equals.

Syllogism 2
- $\angle a + \angle b$ equals $\angle b + \angle c$, *because*
- Each equals two right angles, and
- Things equal to the same thing are equal to each other.

Syllogism 3
- $\angle a + \angle b$ and $\angle b + \angle c$ are each equal to two right angles, *because*
- They each comprise all the angular magnitude on one side of a straight line, and
- All the angular magnitude on one side of a straight line equals two right angles.

And yet a fourth syllogism is really necessary to establish the proposition that all the angular magnitude on one side of a straight line is equal to two right angles.

It will be remembered that in Geometry the "theorem" is always a *conclusion*, from which we work back to the premises supporting it. The natural order of the syllogism is therefore reversed in the above examples.

Why Mathematical Reasoning is so Certain in its Results.—The question arises *why* mathematical reasoning is more certain in its results than other forms of reasoning. The answer is found in the fact that its data are subjective, given by the mind and not sought for in the outer world. It starts from axioms, which are self-evident and absolute, and from definitions which are assumed at the outset, in an unchangeable form. The geometrician makes his own definitions in the beginning and then holds to them consistently. It is this fixed and absolutely definite character of the premises of mathematics which yields the certainty in its results. Other forms of deductive reasoning yield only relative certainty in the conclusions reached.

The Major Premise May Not be Expressed.—The fact should be recognized that deductive reasoning, in ordinary use, does not always conform to the regular, typical forms of the syllogism. As already indicated, the order of propositions may be varied at will; and it often happens that the major premise is a judgment so well known and generally accepted as not to need formal statement. But all deductive reasoning can be reduced, when made formal and explicit, to some of the modes of syllogism.

INDUCTION

How do we Come by General Judgments?—As we have seen, deduction starts from universal judgments. The question arises, Whence come these general judgments? How does deductive reasoning come by its major premises? How does any mind become competent to assert propositions of such breadth? The child is not thus qualified. From the limitations of his narrow experience he is restricted to the use of singular and particular judgments; he can affirm only concerning small fragments of

the universe. Even when experience widens, his conditions remain approximately the same. How can a finite mind ever gain confidence to affirm universal truths? How can I declare that "all men are mortal," or that "all lemons are yellow," since I have had no experience of all the possibilities in either case? How can I feel sure that some future Stanley may not, in the Philippine jungles or elsewhere, discover a blue species of lemon, or that Professor Loeb may not yet discover the elixir of youth? We come, here, to the recognition of a principle or tendency of the human mind to be convinced by limited, and often inadequate, evidence—the *faith* principle, in fact. Through the operation of this, we are able to reach general conclusions of widely varying breadth by a process known as Induction, or Inductive Reasoning.

The Inductive Process.—The typical procedure in this form of argumentation may be illustrated by the following sample:

> This lemon is yellow.
> That lemon is yellow.
> Those lemons are yellow.
> * * * * * * * * *
> All the lemons I ever saw were yellow.
> All the lemons I ever heard of were yellow.
> * * * * * * * * * * *
> Therefore, all lemons are yellow.

Here we begin with singular judgments, of indefinite number, and pass on to particular judgments, limited still by our own experience or that of others concerning which we have satisfactory testimony. But when we have accumulated all available experience and testimony, there is still a gap between that knowledge and universality. By means of the faith principle already recognized, the mind leaps that gap and attains to at least a

working belief in the general conclusion, "All lemons are yellow." Now in what is that faith reposed? The answer is, "In the uniformity of nature," which is more accurately stated in the formula, "Like causes produce like results." "Nature" is often guilty of "freaks," like two-headed calves; nevertheless we continue to trust in her consistency.

The Essential Characteristics of Induction.—The term *induction* has been used by logicians to denote this leap of the mind from the limitations of its positive knowledge to belief in universal laws. In pedagogy, however, the term is applied to the whole process of arriving at general truths, or principles. This process is, in fact, closely similar to that of conception—so similar, indeed, that some writers confound the two.

Both processes begin with the consideration and comparison of particulars or facts; of individuals in the one case, of singular and particular judgments in the other case. Both culminate in generalization, the one result being expressed in a general term, the other in a general proposition.

The distinctive characteristic of inductive reasoning, then, is that it proceeds "from the particular to the general," from the narrow judgments of individual experience to the broad ones which form the basis and the body of science, and furnish the premises of deductive reasoning.

It must be recognized, moreover, that inductive reasoning can never, like demonstrative reasoning, give absolute certainty in its conclusions; but it does yield *moral* certainty, a degree of certainty which serves for the guidance of conduct in the affairs of life.

Early Use of Inductive Reasoning.—The child, by force of his very nature and circumstances, employs inductive

reasoning; but as soon as experience and testimony have furnished him a small stock of general judgments, he begins to use them as premises for deductive conclusions. This, however, is an activity which ought not to be forced, and especially one which ought not to be simulated. To require young pupils to go through the forms of syllogistic reasoning without any clear comprehension of the terms contained in the premises is a stultifying process.

The instinctive tendency of the mind to "jump to conclusions," to exercise the faith principle, is so great that much error and harm result from *hasty induction*, the making of generalizations on insufficient foundation. The old adage, "One swallow doesn't make a summer," is directed against this mischievous practice. Children are naturally very much in danger of drawing hasty general conclusions from their limited experience; they are naturally credulous, and need to be taught the attitude of caution in both thought and statement.

Reasoning by Analogy.—There is a third method of reasoning, known as Reasoning by Analogy. Like induction, it starts from singular judgments, but, unlike induction, it ends also with singular judgments. It is therefore of much less value for either practical or scientific purposes. A good example of this form runs as follows:

The Earth is a planet; Mars is a planet.
The Earth has land and water; Mars has land and water.
The Earth has an atmosphere; Mars has an atmosphere.
The Earth is inhabited; therefore Mars is probably inhabited.

This argument, it will be observed, contains nothing but singular judgments, and reaches no certainty in its conclusions. Since Mars and Earth resemble each other in some particulars, it is more or less probable that they

resemble each other in this other particular of being inhabited. No general judgment is reached. Reasoning by analogy, thus, "proceeds from particulars to particulars," and should not be confused, as it sometimes is, with hasty induction, which always aims at general conclusions. Take this example: A little child has, one day, been knocked over by a big but friendly dog and frightened. On a succeeding day, it sees another big dog and is frightened. It reasons, "That other big dog knocked me over; this big dog will probably knock me over." Whatever of reasoning is done by animals is undoubtedly of this same sort, from particular cases to like particular cases; though such reasoning would seem to be little more, after all, than simple association of ideas.

Analogy also serves a useful purpose with scientific investigators by way of suggesting hypotheses, possible solutions of problems, which may be tested and verified or disproved by other methods.

Relation of the Several Modes to the Progress of Knowledge.—A word may be said concerning the relation of the several modes of reasoning to the increase of knowledge in the individual and the race. It is doubtless clear to the reader already that, while reasoning by analogy has certain important preliminary and tentative uses in paving the way for other methods, the great instrument of practical and scientific discovery is the inductive method. During the ages while this method was neglected by the learned, science made little progress. While the scholars of the world were content to spend their intellectual force in reasoning deductively from premises taken on unverified authority or tradition, with almost no question of their validity, scientific and philosophic results were precarious and illusive. Only with the recognition and predominance of the inductive method did real science become possible.

The question has been much discussed whether deductive reasoning ever adds anything to the sum of knowledge. It is said that since it starts from general truths already established, it can bring forth no conclusions which are not already contained in the premises. This is, in a sense, true. But it is also true that we seldom realize at first the full force and application of general principles. It is the office of deductive reasoning to unfold the implications of general truths, or laws, and thus make them fruitful in the affairs of life.

Summary.—Reasoning is the process of deriving new judgments by the comparison and relating of those previously accepted.

That form of argument known as the syllogism comprises three judgments, two premises and the conclusion. It contains only three concepts, the major, minor, and middle terms.

Syllogistic, or deductive, reasoning starts from broad, general judgments, called major premises, and descends to conclusions less general in scope; it proceeds from generals to particulars.

The safety of deductive reasoning depends on the truth of the premises and the avoidance of ambiguity in the terms and of fallacies in the reasoning process.

Demonstrative, or mathematical, reasoning is wholly of the deductive type, and is characterized by the certainty of its results. No other form of reasoning gives absolute certainty in its conclusions.

The general judgments from which deductive reasoning starts are reached by a process known as inductive reasoning. Starting with particular judgments derived from experience and testimony, the mind, relying on the uniformity of nature, makes the leap to a general conclusion.

Inductive reasoning thus proceeds from particulars to generals. It is the method which must of necessity be used in early years. A danger to be avoided is that of hasty induction.

Reasoning by analogy somewhat resembles inductive reasoning. It proceeds from particulars to particulars, reaching no general conclusions.

The inductive method of reasoning is the great instrument of scientific progress and the increase of knowledge.

Deductive reasoning unfolds the content and implications of general rules and principles, thus making them practically valuable.

REASONING.	Deductive......... (From generals to particulars.)	Demonstrative (Mathematical)	Gives absolute certainty.
		Probable—Gives relative certainty.	
	Inductive.......... (From particulars to generals.)	Probable—Gives moral certainty.	
	By Analogy....... (From particulars to particulars.)	Possible—Gives more or less probability.	

CHAPTER XXIV

LANGUAGE

What Language Is.—The final step in the process of conception we found to be that of Denomination, or the fitting of ideas with names. At this point, Psychology comes into contact with the problems of Language.

What *is* language? When we attempt to define it we come at once upon the question of whether the term shall be held to include the expression of emotion as well as of thought. In the strictest sense, language consists of articulate sounds used as signs of ideas. In the widest sense, language is any means employed in the expression of thought or feeling. More or less confusion results from the ambiguous use of the term. It is well, therefore, to recognize that there is a language of thought, confined in the first place to articulate words and afterwards represented by visible symbols, and also a language of feeling, employing primarily a variety of sounds and muscular movements of a more primitive and instinctive character than the signs of thought.

Division of Language.—Taking language under its broadest and loosest definition, the following division, or classification, has been proposed, viz.:

- LANGUAGE
  - Natural.
    - Absolute
      - Cries, laughter, sighing, etc.
      - Gestures—facial and otherwise.
      - Inflections.
    - Conventional—Speech.
  - Artificial
    - Absolute
      - Painting, drawing, etc.
      - Sculpture.
      - Music.
    - Conventional
      - Writing, in all forms.
      - Signs
        - Telegraphic alphabets.
        - Deaf-mute alphabets.
        - Signaling by lights, etc.
      - Emblems
        - Religious,
        - Masonic, etc.

"Artificial" is to be taken as meaning of human invention, while "natural" means instinctive, arising naturally on due occasion. "Absolute" language is that which needs not to be taught or learned, but is universally intelligible. An American traveler without acquaintance with the languages of the countries through which he passed, remarked, self-consolingly, that wherever he went "the people all *laughed* in English."

Conventional language is that used by common consent, this convention or usage varying with locality and race. An Englishman remarked, on returning from Paris, "How remarkable that the French call bread *pain*—very singular, you know." "But," was the answer, "why should they not call it *pain* as rightfully as we call it bread?" "Aw! because it *is* bread, you know." He could not realize that English was not an absolute instead of a conventional language.

A little reflection will show that the "absolute" language of the foregoing classification is mainly, if not wholly, the language of emotion. Laughter, crying, gestures, and simple exclamations are all signs of feeling. Music, also, must be recognized as a language of feeling only, for it is in no sense an expression of intelligible thought.

The Language of Animals.—Here, also, we encounter the problem of the language of animals. Have animals any language in the strict sense of the term? We must concede at once that they have the language of feeling, natural signs by which they express their desires, animosities, etc. The snarl of a vicious dog is a sample of absolute language, translatable by all concerned. The call of a bird to its mate is also an emotional sign, though less universal in its intelligibility.

But the further question, "Have animals a language of

thought, a system of signs for communicating ideas?" is less easy of determination. Its answer involves an answer to the kindred question, "Can animals think?" and this, again, depends on our definition of *thinking*. We have taken thinking to involve the use of general notions as predicates. If we hold to this view, that thinking is impossible without concepts, then we must say that animals do not think, and consequently have no language of ideas. If, on the other hand, we broaden the term thinking so as to include the procession of images under the laws of association of ideas, we must undoubtedly allow that, in that sense, some animals can think. If a dog guilty of robbing hens' nests be punished by whipping at the nest, or by breaking hot eggs in his mouth, he will fight shy of eggs and nests thereafter. The sight of either will *suggest* under the law of contiguity the pain of punishment and a restraining fear. But there is not the slightest reason to believe that he can communicate the image or the fear to another dog.

The question whether animals lack language because they are unable to form general notions, or lack concepts because they have no words in which to embody them, is more interesting than answerable.

Can We Think without Words?—Turning from animals to men, let us examine briefly the relation of words to ideas. Are words the mere vesture of thought, of which it may divest itself upon occasion? Can we think without words? The answer to this question will be found in the attempt. We adult persons, however much we try, cannot think except in words; but may that not be merely a result of habit? What is the case with deaf-mutes before they are taught any form of language, or with children before they learn to talk? This question has been elaborately argued on both sides, Max Mueller, the eminent

philologist, contending with great insistence that language and thought are, in a sense, identical; that there can be no real thinking without some kind of words. Of course, he considers any symbol of an idea, as the manual signs used by deaf-mutes, to be a word.

The writer of this inclines to a view which may be expressed in the figure that words are the *skins*, not the garments, of ideas, and that ideas (concepts) are born with their skins on. Upon this all must agree, that if any thinking is possible without words, the amount of it is very small and the scope of it very limited. And it would also seem a safe judgment that nothing more than the recall of images, the so-called *associational* thinking, present also in the higher animals, is possible without words. In short, language, in the restricted sense of signs of ideas, is the distinctive characteristic which separates man from the animals. The declaration, "I know, but I cannot tell," is thus seen to be without any validity. What the person saying it means is that he has some vague, undefined notion about the subject, but nothing that amounts to real knowledge. What one truly knows, at the present time, he *can* tell.

Specific Relations of Words to Ideas.—Following further this topic of the relations of words to ideas, we come into the field of Grammar, which classifies words according to the kinds of ideas which they represent, somewhat as follows:

(1) Name-words, which are simple appellations, like tags or labels, used merely to designate. Some of these name classes and are called common nouns; others name single qualities and are called abstract nouns. What are called *proper nouns* are a distinct and peculiar class of words whose function is to represent individual notions. They are not a result of abstraction or generalization,

but derive their force and value solely from Association.

(2) Words of assertion, copulative verbs, including also words which perform the double office of copula and predicate, the "complete verbs" of the grammar-books.

(3) Limiting or qualifying words: (a) Those which limit name-words, adjectives; (b) Those which limit words of assertion, adverbs.

(4) Relation words, known as conjunctions and prepositions, the latter being much more restricted as to the terms of the relation expressed.

(5) Pronouns, a peculiar class of words, differing from nouns in being more highly generalized, as in the words *they*, *it*. They may be thought of as representing concepts in which abstraction is carried to its second power, to borrow a phrase from algebra. This characteristic of pronouns explains the well-known fact that children venture on their use later than on that of any other part of speech. The child long says, "Johnny wants a drink," before using the personal pronoun.

The so-called interjections are hardly words at all. They are not signs of ideas, but only of emotion. They belong, apparently, to the "absolute" language of the outline given on page 161, whereas true words are "conventional."

THE USES OF LANGUAGE

The function of language is thus much more vital and profound than is realized in the common conception. Some further analysis of the subject, therefore, cannot fail to be of service to all who practice the teacher's art.

The Uses of Language are (1) *To think in,—it abbreviates and facilitates the process of thought.* Even if it be possible to think, in a limited way, without words, the

process must be slow and ineffective without the service of words representing abstract and generalized ideas. Consider the abridging, condensing power of such words as *million*, *army*, *animal*, *origin*, etc. If one were obliged, by the slow process of "associational thinking," to reproduce and pass in array all the ants which, one by one, "went to the granary and brought out another grain of corn" in the endless tale of the condemned Oriental wife, or to image each individual soldier of an army before issuing a command, he would indeed realize that "art is long and time is fleeting." It is, in fact, the process of conception which, by its compacting power, makes thought practicable; and language is but the completion of that process.

(2) *It records the results of thinking; it stores up distinctions*, *comparisons*, *generalizations*, etc. This statement relates not only to written language but primarily to spoken language. Every new idea which reaches completion and definition through the spoken word becomes thereby a part of the intellectual possessions of the race. To illustrate the storing of distinctions, let us suppose the word *strike* to have meant originally, in the primitive development of mankind, to *touch* with any degree of force. As men began to discriminate between such acts as striking with the fist, the flat hand, the foot, the head, etc., each would demand a separate act of denomination, and the words *knock*, *cuff*, *slap*, *kick*, *bunt*, *snap*, *nudge*, *punch*, etc., would come into being as marking and fixing new powers and habits of thinking.

The storing of comparisons, which are the complement of distinctions, is seen in the multitude of words which are wholly relative in their force and application, such as *high*, *low*, *long*, *short*, *heavy*, *light*, *old*, *young*, *hard*, *soft*,

and so on, *ad libitum.* A dog is large as compared with a flea, but small as compared with an elephant. A street is long as compared with one's single stride, but short as compared with the equator. Again, all similes and metaphors are simply comparisons expressed or implied; and thus every figurative use of a word embodies a comparison, as when we call one a *blockhead*, a *hard citizen*, a *slippery customer*, or a *square man.* Poetry has for its chief staple the embodiment in words of subtle and, to most people, unnoted resemblances.

(3) *It enables us to analyze complex impressions.* In the perceiving of objects we take in the whole impression, though it is always more or less complex. One, for instance, sees the Group of Laocoön as a whole, which is, of course, made more definite by attention to each of its details; but this experience cannot be reported to another as a whole. It must be analyzed and handed over to the listener item by item; even more so in the case of a witnessed action, or event, as a burning house or a street fight. Any piece of description will illustrate this necessity under which the narrator analyzes the scene word by word, while the listener, beginning with a vague or fragmentary image, modifies or completes that image step by step, as each successive word or phrase falls from the lips of the speaker. Turning from a window where I have had an instantaneous view, I may say to those within, "A big black dog jumped over the fence and caught a cat by the neck." Note the necessity which I am under of breaking this simple event up into elements represented by single words, the listeners, each and all, being under a similar necessity of synthesizing, *pari passu*, that which I have analyzed. For a more interesting example take the opening stanza of Gray's Elegy and trace the gradual synthesis of the picture by the reader.

> "The curfew tolls the knell of parting day,
> The lowing herd winds slowly o'er the lea,
> The plowman homeward plods his weary way,
> And leaves the world to darkness and to me."

Or this other:

> "Now fades the glimmering landscape on the sight,
> And all the air a solemn stillness holds,
> Save where the beetle wheels his droning flight,
> And drowsy tinklings lull the distant folds."

(4) Lastly, *Language is the means of communication.* It serves this end because it serves the other ends which have been discussed. But it is important that we discover just what we mean by communication. It is impossible to *transfer* or *convey* thought from one mind to another. Thinking is individual and subjective; I can think my own thoughts and no others. That which is conveyed cannot at the same time be kept by the conveyor. But to communicate is to *make common.* The "communication" of ideas is possible only through the reciprocal process of analysis and synthesis described in the last paragraph, and the storing-up process discussed in the paragraph next preceding. Yet the ordinary mind thinks of communication as the only function of language, and altogether overlooks its more fundamental uses.

LIMITATIONS OF LANGUAGE

Language has its limitations as well as its uses. We face one of these in the question, *How far is it possible to communicate ideas through language?* (1) One condition is to be found in an established association between the word and the idea. Words in an unknown tongue communicate nothing to me, because they have no suggestive power; I have no association established between them and the ideas which they embody. The word *manana* may signify nothing to me although the idea is per-

fectly familiar, because I have associated that idea only with the word *to-morrow.*

(2) But there is yet a more fundamental difficulty in the way of unlimited communication. I can by no means excite in the mind of a child the idea of *dynamogenesis* or *metabolism*, because the child's mental experience does not yet furnish the materials out of which to elaborate such ideas. *We can communicate ideas only so far as the raw materials already exist in the mind of the learner.* If I place before a child the word *sporran*, it may mean nothing to him, not merely through lack of association but because he has never yet formed that idea. Let me now proceed to explain to him that a sporran is a pocket, made of fur, suspended from the belt, and forming part of the apparel of a Scotch Highlander, and the idea gradually arises in his mind. The data for its construction are already in his possession. He follows my analysis with his own synthesis, and the idea becomes common to us. It must be clearly understood, however, that we have not the *same* image or idea. The listener has his idea and I have mine; they are similar but never identical, nor even exact duplicates. No two persons ever have exactly the same idea of the same thing. And we can put nothing absolutely new into the mind of another. As Dr. Carpenter puts it, "*Language is an appeal to the ideational consciousness of another.*" If that other has not at his command the needful images, which I can call up by this appeal, then I must resort to *presentation* and cause him to get through sense-perception, in some way, the necessary raw materials for constructing those images.

Further Limitations of Language.—Limitations of a different sort are found in the dangers attending the use of language.

(1) First comes the danger which besets all instructors, *the danger that we shall deceive ourselves as to how well we are understood.* The erudite man attempting to talk improvingly to the children in a Sunday-school furnishes a typical example. The college graduate teaching a primary grade is liable to the same pitfalls. The professor lecturing on chemistry to a class of colored youth at Hampton who was sure that they understood him "because they looked so intelligent," was nevertheless the victim of appearances. The teacher is under the constant necessity of rightly measuring the actual consciousness and inner experience of those whom he attempts to instruct, for he cannot make bricks without straw.

(2) Even more serious and more universal is the pupil's danger, *the danger that words may become substitutes for ideas.* Words, so far from communicating ideas, may actually displace them. The most familiar example is found in the "parroting," or learning without comprehension, of definitions. Perhaps the danger of this is greater with beginners in the study of grammar than anywhere else. The head of a great school once declared in the presence of the writer that as a boy he memorized the whole grammar-book, so that he could start in anywhere and recite the text till stopped, and yet understood practically nothing of what it all signified. Most of us have had a similar experience on a smaller scale. The fact that three teachers out of four, in the sentence, "I saw twenty Indians yesterday," would pronounce Indians to be a proper noun, is a pertinent illustration of the danger in question. How many of the children, or adults either, who can glibly recite,

> "Tell me not in mournful numbers
> Life is but an empty dream,"

have a clear or true conception of what is meant by

"mournful numbers"? The evil does not lie so much in knowing the sound and sight of words not understood as in *resting satisfied* with the empty form of the word. Such an empty form is not truly a word to the person who uses it, and he deceives himself by supposing that it has some value.

It is not an evil thing for a child to memorize "Thanatopsis" before his experience enables him to fully comprehend its force. He will get at least some part of its significance, and, in time, will fill up the words with meaning. And he is not likely to imagine that the words have value farther than they are understood. Nevertheless, it should be the constant aim of teachers to prevent the formation by children of the habit of resting content with "words, mere words."

Accuracy in Choice of Words.—Certain habits in the use of language are of such importance to the mental life that no teacher can be pardoned for indifference or negligence with reference to their instillation.

(1) It is not enough that every word should stand for some definite idea, but this should be the correct idea. *Accuracy* should be the aim not simply in orthography and pronunciation, but still more in meaning. Precision in the choice of words marks the truly cultured person. A loose, slovenly choice of prepositions, for instance, gives sure indication of the half-trained intellect, while the inane overworking of a few adjectives, like *awful*, *sweet*, and *lovely*, in scorn of all the rich resources of the mother tongue, reveals either the possession of a poverty-stricken vocabulary or a lackadaisical indolence that would be pitiable if it were not so culpable. Pupils, in school, should be thoroughly indoctrinated with the idea that no two words mean exactly the same thing, that every word has its own delicate shades of meaning, and that

exactness of thinking demands exactness in the choice of words.

(2) The English language is peculiar in point of its elasticity. Of a large share of its words, it is true that each has several shades of meaning, or even several radically different meanings. For example, let any one thread out carefully all the meanings of the familiar words *fast*, *sound*, or *well*. Our discussion of the term *theory*, in Chapter I, furnishes a case in point. The reader, therefore, and especially the listener, must always be on the alert lest he be side-tracked or baffled by calling up a different meaning from that intended by the speaker or writer. To begin with, then, *a clear sense of the varied and possible meanings of words* is essential to the really intelligent person.

(3) *Putting One's Thought in Various Forms.*—A third language habit of great importance to the teacher of any grade is that of being able to put one's thought in a variety of ways, or forms. This is always possible, by reason of the great richness of the English language, derived as it is from so many contributory sources, Saxon, Latin, Greek, etc., and thus so rich in synonyms. This wealth of synonyms affords not only the means of agreeable variety in expression, but also permits a division of labor among words, a differentiation in shades of meaning between so-called synonyms which gives the language great flexibility and power of precise expression. In short, the English language is a grand language to *think in*, if one will only take the pains necessary to become familiar with its resources and possibilities. And, to the teacher, the ability to illuminate a dark saying by translating it with approximate accuracy into a different and more familiar form of words is a resource of the greatest value.

Summary.—Language, in the widest sense, is any means employed in the expression of thought or feeling.

The language of feeling is absolute, or universally intelligible; the language of thought is conventional.

The language of feeling is common to the higher animals, but they have no language of thought, for the reason that they have no general notions, or concepts.

Words are the vital investment of ideas, and are classified according to the kinds of ideas that they represent.

The uses of language are (1) To think in; it abbreviates and facilitates thinking.

(2) It records the results of thinking.

(3) It enables us to analyze complex impressions, and thus becomes

(4) The means of communication.

Language has also its limitations: (1) There must be an established association between the particular form of word and its idea.

(2) We can communicate ideas by language only so far as the raw materials already exist in the mind of the hearer.

(3) There is danger lest we deceive ourselves as to how well we are understood.

(4) There is great danger that words may become substitutes for ideas.

There are certain habits of great importance in the use of language: (1) Precision in the choice of words, accuracy in their application

(2) A clear sense of the varied and possible meanings of words.

(3) The ability to put one's thought in a variety of ways, or forms

CHAPTER XXV

ANALYSIS AND SYNTHESIS

Pedagogical literature has been especially marked by a loose and confusing use of the word *analysis*. It seems wise, therefore, to take some pains to clear up the proper application of the term. And we may begin in a negative way. Analysis is not mere mechanical separation. The housewife cutting a pie in segments for the table is not engaged in an act of analysis. Neither is the man who carves a turkey, except as he emphasizes the distinction between "brown" meat and "white" meat. The boy who takes a clock apart out of pure desire to busy himself is not analyzing it; for the act of analysis has not necessarily any connection with taking in pieces.

Analysis, in a broad sense, is the reduction of a compound or organism to its elementary constituent forms or substances. In chemistry, the term is applied to the actual separation of elements; in botany, it means only the mental inspection and identification of parts according to their functions. In grammar, whether sentential or etymological, it means the same; subject, predicate, and modifiers, prefix, suffix, and root, are parts having special functions. But there is also an analysis which consists only in a mental separation of *qualities*. When we think out the specific qualities of an apple, for instance, observing that it is round, smooth, red, hard or mellow, sour, crisp or otherwise, we are analyzing the apple in a true sense. Suppose one attempts to analyze a mince-pie; he

will not accomplish that undertaking by separating the raisins into one pile, the crust into another, and so on, even if it were possible to dissociate the various constituents which culinary art has combined. The cook, it is true, performs a synthesis, but that is not in the mere mechanical compounding. Each constituent is used to produce a given result, to give the pie certain qualities, and thus has a specific function. So he who separates these qualities or functions, in his mind, by thinking of the sweetening, the shortening, the spicing, the souring, etc., of the compound, performs an act of analysis. We, therefore, define analysis as *the mental separation of qualities, or of parts according to function.* And emphasis is to be laid on the fact that it is mental and not mechanical; it always has relation to meaning, or significance.

We Analyze Individuals, Not Classes.—This brings us to observe that analysis pertains to individuals and not to concepts or classes. When we mentally separate a genus into its species, that is not analysis but logical division. If it were not for creating confusion by further increasing the applications of the term "analysis," we might perhaps call division *analysis of extension.* Analysis proper is analysis of intension. But in analyzing a particular object we may mentally separate *all* its qualities, or simply those which constitute it a member of its species. Thus what we call *abstraction* is only a form of analysis; or, rather, it is a *partial* analysis, effected for a special purpose, the formation of either class concepts or abstract notions.

Analysis and Synthesis.—Analysis is a necessary step in the apprehension of anything, even in the simplest act of perception. I do not recognize a tree, for instance, except by putting temporary mental emphasis on certain

of its qualities and organs. But we never analyze for the mere sake of analysis; it is always as a means to a new synthesis, a more perfect combination of qualities or parts. And synthesis, when the term is rightly used, does not mean a mere putting together mechanically. The piling up of stones in a heap is not synthesis; though the combining of properly fashioned stones to form a complex structure, as in the arches of a bridge, would properly be so called. Each stone has then its definite office, or function. The relation of these terms to pedagogy will be more fully considered in a later chapter.

But we should keep the fact clearly in mind that analysis and synthesis always "hunt in couples"; with whichever one we begin, the other will soon follow. We analyze that we may classify; but all classification is synthesis. What we call abstraction is only a form of analysis; and abstraction is preliminary to generalization, which, again, is synthetic.

Analysis a Form of Discrimination.—In order to a full comprehension of the nature of analysis, we must recognize that it is only one form or stage of discrimination. We have already said, in Chapter IV, that discrimination and assimilation are the fundamental operations of the intellect. They enter into the simplest act of perception; they are the basis of all conception and all judgment; their highest development is found in the processes of induction and deduction. Inductive reasoning is analytic, deductive reasoning is synthetic. Analysis is only a somewhat formal or elaborate process of discrimination; or, if we turn the matter about, discrimination is only a limited, or implicit, form of analysis. And assimilation is only a form of synthesis, combining in thought those elements of experience which resemble each other in some

way. Throughout the whole range of thought, therefore, the processes of analysis and synthesis are indispensable. And the two processes imply, or presuppose, each other.

Summary.—A loose and ambiguous use of the term analysis has caused much confusion in pedagogical discussion.

Analysis is not mere separation, but is the reduction of a compound or organism to its elementary forms or substances. It is the mental separation of qualities, or of parts according to function.

We analyze individuals, not classes. The separation of a genus into its species is not analysis, but logical division.

Analysis and synthesis always go together; the mind alternates between these processes. Analysis is made for the sake of a new synthesis.

CHAPTER XXVI

GENERAL METHOD

What Method Is.—The term *method*, like *theory* and *analysis*, has suffered from great looseness and ambiguity in its current use. Like the word *theory*, its original application was very broad; etymologically, it means simply a *way* of proceeding or doing things. In the development of logical and pedagogical thought, however, it has been more closely restricted in meaning. Strictly defined, in its scientific use, *Method is systematic procedure according to principles.* It implies a goal, or end, and the right, natural, and most economical way of reaching the chosen end. Such procedure, according to principles, cannot be haphazard, variable, or colored by individual idiosyncrasies. The laws, or principles, which govern method are not found in personal habit or caprice, but in the nature of things, the nature of the mind itself. Methods are *discovered*, not *invented*. They are few and not many.

Method and Manner: Special Methods.—It is important, therefore, to distinguish between *method* and *manner*. Women, for instance, differ widely in ways of dressing their hair. They may affect curls, "bangs," braids, or more elaborate coiffures. In this diversity, they may, from time to time, follow the fashion set in high quarters, or they may, more independently, follow the bent of personal taste and preference; but in neither case can the term method be properly applied. What-

ever does not result from fixed laws, but only illustrates individual tastes and peculiarities, is rather to be designated as manner, even though it may be, through imitation, a collective manner. Again, there may be many special contrivances or arrangements, devised in harmony with, and application of, the fundamental principles of method for facilitating the attainment of special ends. These may, indeed, be invented, and are appropriately termed *devices* or *special methods.* Speaking more carefully, a Special Method is an elaboration, with helpful devices, of the application of Method to a particular branch of study. The working out of judicious and effective special methods and devices is an important matter practically; but these must always be in conformity with the general laws of mental acquisition. Failure to realize this or to apprehend the true principles of general method has often resulted in great waste of time and opportunity on catchy and "easy" devices, like the "diagraming" of sentences in the study of grammar, or elaborate schemes of triangulation in map-drawing.

THE INDUCTIVE METHOD

One Method of Learning.—It was said above that methods, in the strict sense, are few. Let us now put that statement to the test. Suppose that one wishes to know all about any class of objects, as grasshoppers; how may he go about such acquisition? Manifestly, one effective way will be to *go where grasshoppers are*, to bring our senses to bear upon them in close and extensive observation. But when we begin this process, what shall we find ourselves doing? First of all, of course, will come *comparison* of instances, specimens; but this comparison cannot proceed a single step without the aid of *abstrac-*

tion, which, as was stated in the last chapter, is only a form or phase of analysis. Now this analysis, or abstraction, will first attack the most general and at the same time obvious qualities of the specimens compared. We shall first note the color, size, and general form, and discover their limits of variation. This will qualify us to take the next step, the making of judgments, or predications, concerning the individuals observed. When the observation has become wide enough, by coöperation or otherwise, the leap to the universal, known as *induction*, may be taken, and affirmations as to color, size, etc., may be made of *all* grasshoppers.

But long before reaching this stage of generalization, which, by the way, is a synthetic step, our analysis will have gone beyond the qualities indicated and have entered upon the observation of organs, or parts having special functions. We shall first observe the general division of the insect into three parts, head, thorax, and abdomen. These, in turn, may be compared and generalized as to their color, form, etc. After which they will, successively, be analyzed into their parts according to functions, as the various head-parts—antennæ, eyes, mouth-parts, etc.

But however far these processes of comparison and abstraction may be carried, the desired result in knowledge can only be attained by the crowning process of synthesis, a bringing together of all the observed facts under general statements or laws which are true of the whole type known as grasshopper. And these generalizations, when firmly established, constitute science.

The Naming of this Method.—This method of intellectual mastery has been variously named, according as separate steps of the process are given prominence. Because it begins with actual objects, or individual

instances, whether material or immaterial, it has been called the Objective Method. This name emphasizes the initial steps of the process.

Because it necessitates abstraction or analysis, it has been properly called the Analytic Method; though certain writers, like Dr. E. E. White, through confusion as to the real nature of analysis, have unfortunately termed it the Synthetic Method, a mischievous error which should be carefully and discriminatingly avoided.

Because this method begins with individuals and, through analysis and synthesis, arrives at general propositions, it has naturally been entitled the Inductive Method. We might accurately enough combine all these names in the compound title, The Objective-Analytic-Inductive Method. But since the objective character is only initiatory, and the term "analytic" is subject to the confusion already pointed out, the name Inductive Method seems the most convenient and also the most accurate, inasmuch as the term "inductive" covers the whole process from beginning to end. The method "proceeds from the particular to the general."

It has also been called the Method of Discovery, because it is the method by which scientific knowledge must first advance, the method by which all the natural sciences have been built up from empirical knowledge of mere facts into systematic general knowledge of laws and principles.

THE DEDUCTIVE METHOD

Another Method of Learning.—Returning to our original endeavor, is there any other procedure by which we may learn all about grasshoppers?

Instead of taking to the fields in quest of specimens, let us resort to the library. There we shall find books on

Natural History and Zoölogy. Let us select, for instance, Tenney's Zoölogy, a text-book of high repute in years not long past. Beginning its study, we encounter first a definition of Zoölogy as a whole, and of the term "Animal Kingdom." Next follows a division of animals into Branches, or Types, as vertebrates, radiates, etc., followed by definitions of each. When these definitions have been duly amplified, each of the Branches is again divided into Orders, and so on. Thus the work proceeds by alternating definition and division, until, after four or five hundred pages have been turned, we come to a few condensed pages on grasshoppers and their species. And it still remains for us to find actual specimens and apply to them the abstract definitions of the book to see what we have found.

The same general mode of procedure will be found in most text-books in all subjects. In Grammar they begin with the definition of language, or of grammar, divide it into Orthography, Etymology, Syntax, and Prosody, and continue to define and divide through all the parts of speech and their subdivisions. They also formulate general rules for the composition of words in actual use. The Geographies of a day not very far remote began with the consideration of the earth as a member of the solar system, and the first chapters were devoted to Mathematical Geography, the most difficult and abstract part of the whole subject, whereas inductive study of geography begins with the home landscape.

Names of this Method.—A very brief inspection reveals the fact that this method of procedure is, in a sense, the exact opposite of the Inductive Method. It begins with definitions, the broadest generalizations possible in any subject, and narrows down by logical division towards the concrete, individual facts. Its chief labor consists not in

the discovery and establishment of general judgments, but in the assumption of these and the application of them to particular cases. The method starts not with concrete, objective facts, but with logical abstractions, creations of the human mind itself; it may therefore be called a Subjective Method.

It does not resort to analysis, but endeavors to put specific cases under general laws. For this reason, that it puts individuals together under the law of the species, and species together under the genus, it has been called the Synthetic Method.

Because it, after the manner of syllogistic reasoning, proceeds from the general to the particular, it is rightly named the Deductive Method. Combining these names as before, we may call it the Subjective-Synthetic-Deductive Method of presentation.

It has also been called the Method of Instruction, or more fitly the Method of Doctrine, from its common use in presenting systematically the gathered up results of scientific investigation and generalization in compact form. It has been well said that by following this method of presentation in school studies we require the pupil to begin where the scientist and philosopher leave off.

The Complete Method.—But no science completes itself by the inductive method alone. As fast as its great generalizations are reached, it turns them to account by their deductive application, and by tracing out all the practical implications of the laws inductively established. Thus it happens that later, or more advanced, parts and stages of any science become more and more deductive, as is well illustrated in the case of Physics. The same truth holds with reference to the smaller divisions of human knowledge, the sub-topics, so to speak, of science. We shall not be successful in our attempt to learn all about grass-

hoppers by the inductive method. We must also make what is called, in the pedagogics of the day, "the return from the general to the particular." When definitions have been reached by induction, they must then be carefully and strictly applied. This supplementing of the inductive procedure by the deductive, the combination of the two methods, has been called the Complete Method.

It has been common in the pedagogical literature of the past generation to name a multiplicity of methods of presentation, through failure to see that there really can be but two, the procedure from the concrete and individual to the abstract and universal, and its reverse. Thus we find mention of the Analytic, the Objective, the Inductive, and the "Developing Method" as distinct methods, in apparent obliviousness of the fact that they are really only different aspects, at most, of the same general procedure. No harm will result from the interchangeable use of these terms if only their common nature is clearly recognized. The so-called Complete, or Inductive-Deductive, Method is, of course, not a distinct method. It might, indeed, be thought of as combining the two general methods in one.

Further Illustration of the Two General Methods.—A clear apprehension by the reader of these two methods in practical application doubtless demands further illustration. Take, for instance, the special methods of teaching beginners to read, viz., the Alphabet Method, Phonic Method, Word Method, and Sentence Method; are they respectively inductive or deductive? Let us put them to the test. The concrete unit in reading is clearly the particular, individual thought, expressed in a sentence. If we start with this, the child must analyze it into its component words. The words, in turn, may be analyzed into their constituent sounds. The process is analytic; the

method is the inductive. There is the same general movement of mind in the word method, which starts with the word or idea as a significant unit.

On the other hand, letters are abstract; they are highly generalized symbols, and have no concrete significance, or content. They only represent elementary sounds, and these sounds have no individual significance. Both letters and sounds must be synthesized into words before any significance emerges; and words must still be combined into sentences before we have any reading. The alphabet and phonic methods are, therefore, synthetic, deductive.

Again, in Geography, what would constitute an inductive or a deductive study of a city, as St. Louis? The boy who grows up in the city begins, of course, with the particular, concrete parts, or elements. He goes where they are; he employs his senses upon them, analyzes them. He analyzes the whole city in course of time, and at last, if he prosecutes his study far enough, he forms in mind a map, a general plan, of the city, its residence districts, its manufacturing districts, its transportation facilities, etc. He has analyzed the great organism into parts according to function, and has again brought these together in a comprehensive synthesis. He now knows the city as an aggregate. But the non-resident adult, going to the city for the World's Fair, will, before leaving home, procure a map and guide-book and study them to get the general plan and character of the city and fair-grounds, and will apply this general scheme to the particular facts and details when he comes in contact with them. This will be an example of the synthetic, deductive method of learning.

In the study of the mother-tongue, the young child begins with concrete details and makes all his advances

by observation and experiment. He gets at the meaning of the words he hears by a succession of hypotheses, or tentative interpretations, which he revises and corrects by the aid of growing experience. He arrives at the rules of grammar and composition slowly and inductively, during the early years. When he comes to the study of formal grammar, this process is reversed, and he now begins to work backwards from definitions and rules to their application in practice. And fortunate is he if intelligent application is insisted on and secured, without allowing words to become substitutes for ideas. In the study of foreign languages, the deductive method starts with grammar and dictionary; the inductive, or "natural," method begins with conversation and the naming of objects after the manner of childhood. Which of these is the more fruitful method depends upon circumstances and upon the practical ends in view.

The Place of Inductive Method.—The truth hardly needs further emphasis that the inductive method is necessarily the true and only successful method for the early stages of learning. The child's progress in knowledge before he is sent to school is greater and more important than we commonly realize; and it is all attained to through objective experience. The child tumbles on the doorstep, falls on the ice or into the water, touches his hand to the stove, falls out of the apple tree, or cuts himself on broken glass, and so learns the properties of matter—studies elementary physics, in short; though he does not formulate the law of gravitation, or any other, till a later period. As years advance and experience widens and he acquires the means and power of deductive reasoning, the deductive method of learning and teaching becomes more and more feasible and profitable. But the time never arrives when he can

dispense altogether with inductive study. The primary, fundamental ideas in any branch of study, unless it be mathematics, must be acquired objectively in all grades of school. It is for this reason that our universities are providing such elaborate and expensive equipment for laboratory work and the experimental method of study and investigation.

Advantages of the Inductive Method.—While the inductive method of teaching is now being urged upon educators everywhere as the natural and necessary mode of acquisition, it is nevertheless true that it has, along with its great advantages, certain important limitations. Its recognized advantages are:

(1) It *insures a clear apprehension* of the knowledge acquired; it results in real knowledge. "Seeing is believing" is a familiar adage; it gives the feeling of reality. And, in like manner, the knowing which is based on concrete experience is a secure and usable possession.

(2) It *secures an active state of mind* on the part of the learner. The learner is not merely a recipient of second-hand judgments and a slave to authority. If not an originator of knowledge, his mind is at least in a state of active coöperation with that of the teacher.

Limitations of the Inductive Method.—The limitations of the inductive method are partly logical and partly practical.

(1) *Some studies are deductive in their nature*, especially mathematics. Geometry, for example, starts with axioms and conventional definitions. Its first theorems are of the broadest and most general character. Out of these are unfolded, step by step, narrower and narrower propositions depending for their validity on the broader ones from which they are derived. The whole process of thought is deductive, as was illustrated in Chapter XXIII.

History, again, is not to us a matter of experience, it must be taken principally on human authority. Archæology, the study of ancient ruins and relics, may indeed be studied by the objective, inductive method; but its scope is limited, and its results do not constitute history proper. Any attempt to study history by this method only results in a sort of *quasi*-induction.

(2) Among practical difficulties, the first to be noted is that this form of instruction costs so much, in the way of apparatus and equipment. The apparatus required for primary teaching, where the method is most needed, is simple and inexpensive. But as education progresses upward the necessary equipment becomes more and more elaborate and costly. The cost of the cabinets and laboratory outfits demanded by a modern university reaches into the millions.

(3) A further objection is that the method is slow, takes so much time. Observation and analysis are always slow processes. The basing of knowledge on observed fact does take time; and if the generalizations of science, the laws and principles of the universe, could be truly learned and mentally assimilated by taking them at second-hand in their perfected scientific forms, the deductive method would truly be more expeditious. And, doubtless, it is not necessary that the pupils should rediscover the established principles of science; that process *would* consume too much time.

(4) Another hindrance to the more general use of the inductive method in elementary schools arises from the fact that it makes such great demand on the teacher in the way of both general and special preparation for his work. With the deductive method, most of the work of instruction, the planning and formulation of the work, has been done by the author of the text-book; the

teacher is often little more than the hearer of lessons. The teacher using the inductive method, on the other hand, must not only know his subjects, but must exercise wisdom and good judgment in laying out the work and planning lessons, and be skillful in presentation. He must know how to direct the pupil's energies to avoid "scatteration" and waste of time. This means that he must have an adequate professional training and make a daily preparation for his work such as is not expected from the text-book teacher. But such teachers cost money. They cannot afford to teach for the wages which unskilled teachers are willing to take; and tax-payers are not generally partial to high-priced teachers. It thus happens that motives of parsimony or false economy present the greatest obstacle to the more general use of really scientific methods of teaching.

(5) Yet another criticism made upon the inductive method is that it does not sufficiently train in the use of books. When the pupil leaves school and teachers, his education is only begun; and he must prosecute it further principally by the use of books. And it is urged that inductive teaching, dealing largely with objects at first-hand and relying little on books—since the teacher's work will be chiefly oral in form—does not train pupils to the effective use of books, does not teach them how to get out of books what is in them. There is some force in this view; but the difficulty is not an insurmountable one. It is certainly important that pupils should be trained to familiarity with books and made skillful in the use of indexes. The ability to find and digest what is really needed in a book, without swallowing it whole, is a valuable if not indispensable acquirement for the modern student.

What is Really Economical.—The answer to the objec-

tions raised on the ground of cost in time and money is that any method is economical which produces sound and durable results. "The longest way around is the shortest way home" is a familiar adage which may well find application here. And any method which results in vague, indistinct apprehension, in easily forgotten because unassimilated formulæ, and the substitution of words for ideas is a costly and wasteful method, no matter what short-cuts it may seem to offer. Thus the successful teacher, in the long run, must have such a training and such a comprehension of the laws of learning as will enable him to make the due adjustment of methods to each other and to the mental status of the pupils under his tuition.

Summary.—Method is systematic procedure according to principles. These principles exist in the nature of the mind itself; they are discovered, not invented.

We must distinguish between method and manner, which latter covers all procedure growing out of individual tastes and peculiarities.

We may also distinguish special methods, or devices for the application of general method to particular studies.

One method begins with the observation and analysis of individuals, and aims to evolve general laws and truths; this may be called the Objective-Analytic-Inductive Method.

Another method begins with broad generalizations and proceeds by alternate definition and division towards particulars, or individuals. This is called the Subjective-Synthetic-Deductive Method.

The great advantages of the Inductive Method are that it

(1) Insures clear apprehension,

(2) Secures an active state of mind, coöperation on the part of the learner.

It has certain limitations, viz.:

(1) Some studies are deductive in their nature.

(2) The cost of apparatus and equipment.

(3) It takes so much time.

(4) Its great demand upon teachers.

(5) Does not sufficiently train in the use of books.

While the inductive method is the natural method for beginners, neither method alone is sufficient. The combination of the two has been called the complete method.

CHAPTER XXVII

HABIT

Our study of the psychology of the cognitive, or intellectual, powers led us naturally to the study of some topics belonging to Logic, the science of thought, and of General Method, which bridges the space between logic and pedagogics. Let us now return to psychology for a brief consideration of those mental activities which are not included among the knowing powers, but which are no less essential to the life of the soul. The subject next to be considered might well have been taken up much earlier in our course had we not been so intent on our analysis of the knowing powers.

The Basis of Habit.—That modification of brain structure, or of the whole nervous system, which we have seen to be the physical basis of memory, is also the physical basis of Habit, which may be characterized as the nervous, and mental, tendency to do again that which has once been done, to reproduce forms of action which have become familiar by repetition. It comes into existence through what we have called, more or less metaphorically, the forming of paths, or grooves, in the nerve tissues, or structures. Any action once performed is, by virtue of that fact, more easily performed thereafter. "Acts once occurring tend to recur" is a fundamental law of habit, as "Mental experiences occurring together tend to recur together" is a law of memory. No conscious experience leaves the brain as it found it. Every

conscious act inaugurates a tendency, be it never so slight, to a renewal of activity of the same sort; and every recurrence of such activity deepens the channels, so to speak, and makes easier the requisite nervous reaction.

Examples of Habit.—Illustrations of the operation of the principle of habit are seen throughout animate nature. Something analogous to it is seen even in the inorganic realm. A piece of paper once folded on a given line and then smoothed out ever so carefully will always fold again more easily along that line. The dressy man's trousers must be often pressed to take out the wrinkles which insist on reappearing in the same positions. Even the weather seems to get into ruts of habit; when it gets to raining it is liable to keep on raining, and nothing seems more persistent than a drought. Specific examples of habit in human behavior are seen in the act of walking, in the accustoming of our fingers to the use of knife and fork or the playing of musical instruments, in our antipathies to or fondness for certain foods, and especially in addiction to such narcotics and stimulants as tobacco, opium, and alcoholic beverages. We also form definite and persistent ways of thinking and feeling; we become habitually argumentative, censorious, or polite.

Essential Characteristics of Habit.—Analysis of habitual activities shows them to possess invariably the following characteristics, viz.:

(1) By virtue of repetition and the retentive principle already discussed, acts become more and more *easy of execution.* As a consequence of this increased ease of performance, they are executed more rapidly. This is well illustrated in the process of learning to write or to finger a musical instrument.

(2) A further consequence of the greater ease of execution is found in a correspondingly *diminished intensity of*

the attendant consciousness. Compare the intensity of conscious effort of a boy in his first piano lessons, or a beginner in club-swinging, with the almost unconscious action of the skilled pianist or gymnast; or, again, the first struggles over the multiplication table with the easy computation of the practiced accountant.

(3) A third and crowning characteristic of habitual action is its relative *perfection.* The practiced accountant does not make mistakes in his additions as does the tyro; the club-swinging or other gymnastic exercise once difficult has become at once more easy, more unconscious, and more perfect in execution. "Practice makes perfect." Here the act of walking serves again as an illustration. When the necessary muscular coördinations have become perfected and consolidated by practice, that which was so difficult to the learning child has become easy to the point of unconsciousness. The action is now, not reflex indeed, but automatic, habitual. The person who writes most perfectly, as a rule, writes with the greatest ease and the lowest degree of consciousness. It is not the beginner nor the occasional marksman who is a sure shot.

Difference between Habitual and Reflex Action.—It is well to emphasize here the distinction between habitual and reflex action. Habitual action resembles reflex somewhat in the diminished consciousness; yet, as we have seen, reflex action may be intensely conscious. But all habitual acts were, in their inception, voluntary. Their automatic character is always acquired, the reverse of which is true in reflex action, whose most essential characteristic is its involuntariness. For this reason, we must consider the almost unconscious activity of the preoccupied walker to be not reflex, but habitual, secondarily automatic.

Difference between Habit and Instinct.—A similar distinction must be drawn between habit and instinct. Instinctive action, though complex, is, in a sense, reflex. Moreover, it is innate. Instincts develop, and blossom on proper occasion, without any volitional process of training or habituation. The bee does not *learn* how to build its comb, nor the insect where to lay her egg. Habit, on the other hand, always has its beginning in voluntary acts and is often the result of long and painful training. It may be said with an approach to accuracy that instincts are inherited habits, while habits are acquired instincts; but habit begins in voluntary acts of the individual, while instinct does not. It antedates volition.

The Effects of Habit on Life.—Rousseau, posing as an educational reformer, and others following his lead, have inveighed against the rule of habit, holding that action should always be governed by rational considerations and the perceived conditions of the moment rather than by tradition or inertia. It behooves the teacher, therefore, to consider intelligently the importance of habit to our mental life both as to its advantages and its hindrances. We have already seen that it results in greater ease and perfection of action, along with a diminished strain of attention. This allows us to perform many of the actions of daily life, including those most necessary to our physical existence, with a low degree of marginal consciousness, leaving the attention free to focus on other and parallel activities which by reason of their rarity or difficulty have not yet been reduced to routine. In other words, much of our muscular activity is turned over to the almost automatic control of the lower nerve centers, while the higher centers are left free to direct the more complex and difficult operations which require the full light of

focal consciousness. Thus a woman may successfully keep on with her knitting, or play a familiar tune on the piano, while carrying on a conversation which demands new adjustments of attention at every step. So there comes to be a sort of division and organization of labor among the nerve centers which adds greatly to the freedom and efficiency of our physical and mental activities. This has been compared to the conditions existing in a department of government, or great business office, in which the simpler and more ordinary labors are turned over to clerks and subordinates, while the higher officials are left free to direct the more difficult and important decisions which cannot be reduced to routine but must be decided by the highest intelligence.

A further value of habit lies in its relation to skill. It is habit that frees us from the awkwardness and inefficiency of our earlier peformance. If this were not true and if such acts as the use of knife and fork, the acts of articulation and of writing, the use of tools, or the setting of type, were always to remain as awkward and slow of performance as in our first experience with them, we should hardly be able to maintain our existence, to say nothing of reaching a high point of development and power. And the same principle operates towards facility of mental operations as well as physical acts. Habit is thus a great liberating agency, which makes possible the diversified activities, physical and mental, of the civilized man.

The Bondage of Habit.—On the other hand, habit, which with one hand brings us freedom, with the other brings us slavery. It tends to fix our modes and courses of action in rigid lines. We all have abundant experience of the bondage of habit, the great difficulty of escape from its control when it has once been fixed in lines which

we afterwards find to be disadvantageous. Apt illustration ot this is furnished by the difficulty of correcting careless or inaccurate forms of speech, or rustic manners. Still more serious is the slavery imposed by the effects on the nervous system of the drink habit, the tobacco habit, and other vices of appetite. Again, such habits as the scolding habit and the habits of prevarication or exaggeration may work a vitiating effect on the whole life and career of those who once become addicted to them. When St. Paul cried out, "The thing that I would not, that I do," he was probably feeling the coercing effect of an enslaving habit. And these tyrannous habits are, for the most part, formed very early in life, while the nervous system is in its plastic and formative state. The majority of evil habits are fixed upon the youth with fatal force before parents have once awakened to the possibility of danger.

The question, then, as to the good or evil of habit is only a question as to the choice of habits. Good habits are the savor of life unto life. They are a safeguard to the soul in unguarded moments and in times of stress and temptation. They make possible all the goodness and greatness of life. Bad habits are the savor of death unto death. They corrupt the issues of life and hold us in chains which gall us with the sense of our perverted manhood.

The Relation of Education to Habit.—Education consists largely in two things, the setting up of worthy ideals and the establishment of right and useful habits of mind and body. But many of these habits must be fixed, if at all, before the age when ideals can be brought to bear effectively. And the unwisdom of parental neglect cannot always be overcome by the wholesome influences of the school; they come into the field too late. But, early and

late, it is true, as Professor James has so aptly said, that "*a chief aim in all education is to make our nervous system our ally and not our enemy.*" When this declaration is apprehended in its full force it will furnish priceless guidance for the educational endeavors of both home and school. To quote further from Professor James:

"Could the young but realize how soon they will become mere walking bundles of habits, they would give more heed to their conduct while in the plastic state. We are spinning our own fates, good or evil, and never to be undone. Every smallest stroke of virtue or of vice leaves its never so little scar. The drunken Rip Van Winkle in Jefferson's play excuses himself for every fresh dereliction by saying, 'I won't count this time.' Well! he may not count it, and a kind Heaven may not count it; but it is being counted none the less. Down among his nerve cells and fibers the molecules are counting it, registering and storing it up to be used against him when the next temptation comes. Nothing we ever do is, in strict scientific literalness, wiped out."

Good Habits Not Spontaneous.—It seems to be a law that bad habits, like weeds, spring up without effort and almost without observation. Being in harmony with our animal and instinctive propensities, they need no stimulation but only repression or suppression. But good habits, those which serve the ends of our higher nature, like flowers and useful plants, require great pains and watchfulness both in the seed-time and in their later development. Parents and teachers must remember that eternal vigilance and patience are the price of wholesome, helpful habits, whether in the field of manners, morals, or intellectual and industrial efficiency. Such intellectual habits as good writing, clear articulation, accuracy in computation, and intelligent punctuation can only be established

by watchful and persistent effort in the early years; while those high spiritual habits of courtesy, respect for rightful authority, and purity of thought and imagination demand the highest order of personal influence. Good habits are costly, but they are worth the price.

Summary.—Habit is the tendency to do again that which has formerly been done. Acts once occurring tend to recur.

The essential characteristics of habit are (1) Increasing ease of performance, due to repetition. (2) Diminished intensity of attendant consciousness. (3) Greater perfection in the action. "Practice makes perfect."

Habitual actions differ from reflex actions in that they are at first voluntary; their automatic character is always acquired. Habits differ from instinct in the same way.

The greater ease and perfection of habitual action, and its light demand upon attention, furnish great relief to the mind and add greatly to its freedom and efficiency. Habit results in great economy of mental energy.

But while habit with one hand brings us freedom, with the other it brings us slavery. The bondage of bad habits is the most grievous handicap of human life.

Education consists largely in the early and firm establishment of right and useful habits, and the elimination or repression of evil and disadvantageous ones.

"A chief aim in all education is to make our nervous system our ally and not our enemy."

Bad habits resemble weeds in the spontaneity of their growth; but good habits, like flowers, require great care and vigilance in their cultivation.

CHAPTER XXVIII

INSTINCT

Vagueness in the Use of the Term.—Perhaps no term employed in the discussion of human or animal experience is used so loosely or with so little clear conception of the actual fact for which it stands as the word *instinct.* Indeed, it is most often used, in common speech, as an evasion, to escape rather than furnish explanation. When we say that animals are able to do wonderful things "by instinct," we have explained nothing; the problem still remains as dark as ever. What *is* instinct? What should we mean by that much abused term? Even among psychologists and writers on animal intelligence, the word seems to be used with more or less ambiguity, sometimes in a loose, comprehensive sense and sometimes with a more strict and technical signification. But that is the misfortune of many other words as well.

Instinct Applies only to Action.—It is perhaps well to note, at the outset, that the adjective *instinctive* is properly applied to action only; it has no necessary connection with intelligence, or knowing. There is no such thing as instinctive knowledge; instinctive action is action for which knowledge is not necessary. There is no "know how" connected with it. And the most impressive and marvelous exhibitions of the operation of instinct are found in the lower grades of animal life, where intelligence is, at best, of a very low order.

Illustration of Instinctive Action.—Before entering upon any further discussion of the fundamental nature of this power, or endowment, it will be useful to cite a variety of examples of its exercise. Stock examples, familiar to all, are found in the actions of newly-hatched birds and reptiles, the mating and migration of birds, the intricate nest-weaving of certain birds, as the oriole, the cunning of the fox and death-shamming of the opossum, and the homing of pigs and carrier-pigeons. But much more complex and wonderful examples are to be found in the lower ranks of the insect world. The coöperative activities of bees and ants, with their peculiar social organization, are sufficiently striking examples; but even more astonishing are the various adjustments in the life history of moths, spiders, dragon-flies, water beetles, and even earthworms.

A giddy fly stings its egg through the soft shell of a growing nut at just such time that the egg and the nut shall ripen together. The shell hardens, the kernel matures in time to furnish a magazine of food for the growing grub, which lasts him until his "teeth" are sharp enough to pierce the hardened shell and enable him to make his *début* on a new field of activity. Meanwhile, during his seclusion, the parent fly has departed life and the orphan grub has no instructor for his future needs any more than he had within his nutshell home. Who taught the fly where and when to lay her eggs? Who taught the honey-bee geometry? No one; they never learned, never had to learn.

Characteristics of Instinctive Activity.—These puzzling and seemingly miraculous activities have much in common with reflex action. Indeed, a writer of great fame has defined instinct as "compound reflex action," and the definition has been widely accepted; though it suggests

at once that instinctive action differs from reflex *in* its greater complexity. But while the two have much in common, the conviction is forced upon us that there is in instinctive action something more than the simple response to stimulus which constitutes reflex action.

In any case, we may note the following salient characteristics, as suggested by Prof. Lloyd Morgan ("Habit and Instinct," Chapter I).

(1) Instinctive activity, though initiated, like reflex action, by some external stimulus, "is a response of the organism as a whole, and involves the coöperation of several organs and many groups of muscles." It is also "determined in a greater degree than reflex action by an internal factor which causes uneasiness or distress, more or less marked, if it do not find its normal instinctive satisfaction," as in the case of the incubation and migration of birds.

(2) In the second place, instinctive activities are *not individual* in their character. They are common to all the species and are similarly performed by all its members. Moreover, they seem to be of a purely necessary and mechanical character. Given a certain type of organism and suitable conditions in the environment, and the phenomena of instinct follow without any individual variation or idiosyncrasy. This is not saying, however, that instinctive tendencies may not be overlaid and modified by experience, by habit, and especially by association.

(3) A further and most important characteristic of instinctive actions is seen in the fact that they, for the most part, have reference to *the perpetuation and welfare of the species*, or race. They are not isolated or incongruous acts, as reflex actions sometimes are, but constitute a system, a safe and sure provision which Nature has established for the preservation of her manifold types in

the organic world. And these racial instincts have reference not only to procreation, or reproduction, but also to the preservation of the individual from his enemies and natural dangers.

The Explanation of Instinctive Activity.—Thus far, we have considered only the external characteristics, so to speak, of instinctive actions. But what lies back of all these? What is the *explanation* of instinct? Is it something ultimate and inexplicable, a sort of miraculous endowment concerning whose causes nothing more can be said? Science is not willing to look upon it in such a light, but seeks for some intelligible theory of its origin. And its latest word, stated as simply as may be, seems to be this: The explanation of instinct must be furnished by the laws of physical life, by the science of biology. The fundamental thing in instinct is the principle of heredity. But what is it that is inherited? Not knowledge, nor intelligence of any sort, but simply certain nervous coördinations, certain definite arrangements of nerve cells and paths which are already adapted to produce muscular responses of a definite and useful sort.

The human being spends much time and effort in fashioning his nervous system, in habituating it to the performance of desired activities; but the animal, acting under the law of instinct, is saved that trouble. It inherits its most important coördinations *ready-made*, and the machine runs perfectly, from the start, in response to external and internal stimuli. Instinct has been called "inherited habit," and the phrase is not wholly inaccurate.

Instinct in Man.—Man is, we say, a rational being whose life is largely controlled by intelligence and volition. It is commonly held, therefore, that his instincts are few and comparatively unimportant, being confined in

their operation mostly to infancy. There is a contrary view, however, of which Prof. Wm. James is the most prominent representative, which holds that man's instincts are even more numerous than those of the lower animals. This conclusion seems to be made possible by resolving all the emotions into instincts. It would thus seem to be largely a matter of definition; but it hardly seems reasonable to ignore the distinction between instincts and emotions, whatever points of connection they may have.

At all events, man's instincts lack the definite, necessary character which is characteristic of animal instinct. They are more transitory and are largely obscured and modified by the exercise of rational and volitional activities. The life of the insect is largely, if not wholly, ruled by instinct; while in man reason divides sway with habit.

Transitoriness of Some Instincts.—It is important to note, finally, that while some instincts are peremptory and irresistible, others are liable to suppression or starvation. Chicks instinctively follow the hen at birth, but if kept from the hen ten or twelve days they will thereafter pay her no regard. Instincts have their normal time of ripening, or rather of blossoming, and must then have scope for exercise or they are liable to decay or disappearance. Some are active in the first days of life; others are held in abeyance, as it were, and spring into activity at later stages in the life development.

Summary.—The term *instinct* is often used very vaguely; in itself it does not explain anything.

The word *instinctive* is properly applied only to action; there is no instinctive knowledge.

Instinctive activity has much in common with reflex action, but is more complex. Its salient characteristics are: (1) It is a response of the organism as a whole, involving several organs and groups of muscles. (2) It is not individual in its character, but

common to all the species. (3) It has special reference, as a rule, to the perpetuation of the race, or species.

The fundamental thing in instinct is heredity, the inheritance of certain nervous coördinations adapted to produce certain definite muscular responses.

In adult human life, the operations of instinct are much modified and obscured by the exercise of reason and volition; yet they are of great importance, especially in the early development of children.

Some instincts are transitory in their activity; if they do not have timely opportunity for exercise, they are liable to be suppressed and atrophied.

CHAPTER XXIX

THE FEELINGS

What Feeling Is.—Feeling is that phase of consciousness by which we attach a value, positive or negative, to our experiences. It is that subjective quality of mental experience which makes life worth living and makes voluntary activity possible. If all experience were colorless, a matter of indifference, life would be purely mechanical, and even the motive for existence would be lacking. (For other discussion, refer to Chapter IV.)

Classification of Feelings.—Feelings may be classified on various bases of division; but the most obvious division is that according to their apparent origin and trend of movement, namely:

(1) *Sensations*, or feelings of bodily origin. These, as we have already seen, in Chapter IX, have as their physical antecedents the stimulation by physical agencies of the peripheral terminations of sensory nerves, and the setting up of nerve currents flowing into the brain. As to their physical relations, they are *centripetal.*

While they all have varying degrees of the pleasure-pain quality, or tone, and thus furnish motive for action, their most important office lies in their relation to knowledge, their cognitive aspect. And we rank as highest those which have this cognitive function in the highest degree. The classification of sensations was worked out in Chapters IX to XIV.

(2) *Emotions*, or feelings of internal origin. What the physical antecedents of these feelings may be is still largely a matter of speculation and controversy. The first observable fact is the feeling itself, arising in the mind upon due occasion, which is usually some mental image aroused under the laws of association. Some remembered experience or imagined situation excites a feeling of anger, joy, or fear, which *seems* to be a spontaneous activity of the soul itself. But such feelings always have discernible physical consequences, however uncertain and obscure their physical antecedents may be. The accompanying brain excitement pours out a current through the motor nerves, and some form of physical expression results. As the word implies, emotions move outward; they are *centrifugal.*

Their modes of outward expression are manifold both in kind and degree. They may take the form of energetic muscular contractions, as in running away; of vocal sounds, as in laughter or crying; of facial expression, blushing, the brightening of the eyes, the creeping of the scalp, "goose flesh," and all the various disturbances of the circulation. In the disciplined adult, these overt expressions are to some extent inhibited, or held in check; but in young children and in undisciplined persons, they have free play and reveal with certainty any emotional tumult within.

The Reflexive Effect, or "Back-stroke" of Feeling.—But this physical outcome of emotional excitement does not end with simple expression. It, in some way, reacts upon the exciting emotion, increasing or otherwise modifying it. Thus the outward expression of anger in set teeth, clenched fists, and especially in violent language, returns upon the mind; and, within limits, the more we fume the angrier we become. He who runs through fear draws

fresh fear from his own flight; and he who laughs tickles himself anew, until his laughter, perhaps, becomes uncontrollable. This reflexive effect of emotional expression is tacitly recognized in our prudential efforts at repression, in such maxims as, "When you are angry, count ten before you speak; if very angry, count a hundred," and by the traditional boy who whistles while passing a graveyard at night.

But the attempt to smother emotion by suppressing its physical expression does not always have a successful issue. Inhibition seems, sometimes, to act only as a sort of dam, which serves to accumulate nervous energy until it finally breaks over the restraint with explosive force. The ultra-vigorous expression which follows furnishes relief, and the wave of feeling rapidly subsides.

The Genesis of Feeling.—Under what conditions does feeling arise? What are the stimulating causes of the pleasurable or painful tone of consciousness? In the case of organic sensations, we have seen that it was due to physiological changes, the disintegration of tissues from various causes. Other sensations result, also, from physical causes. With emotions, the case seems to be different; they seem to arise as always the consequences, or at least the concomitants, of action or of ideas. Activity and emotions of certain kinds appear to be inseparably connected, especially in the experience of young children. In our adult consciousness, emotion seems to require an antecedent in the form of images or ideas. If we are angry or joyful or envious, the feeling has some objective terminus in our minds. If our feeling is one of eagerness for action, even, there must first be in mind some pictured result of action. Whenever we see a person manifesting the expressive signs of emotion, we always mentally seek for the intellectual antecedents, the ideas which have called up his emotional state.

The pleasure-pain element in feeling, especially in sensation, seems to be definitely related to the degree of stimulation. In general, it may be said that pleasurable sensation is the result of moderate stimulation, while low or high degrees of excitation result in pain. Thus the full glare of the sun in the eyes, or the dimness of fading twilight or a foggy day, are disagreeable, while the normal amount of sunlight is always enjoyable. What we desire as to all stimulations is that they shall be "just about right," avoiding excessive extremes.

Different Types of Emotion.—Emotions have been classified, among other ways, into (1) Egoistic, or Self-regarding, (2) Altruistic, or Social, and (3) The Higher Sentiments. The egoistic, or anti-social, feelings are strong and comparatively well defined; they are those primal, elemental feelings whose aim is self-preservation, and which man shares with the higher animals. Among them are Anger, Fear, Hatred, Vanity, and Love of Power and Dominion. These feelings are necessary to give force and efficiency to the life and character, but must be tempered by and properly correlated with the higher emotions.

The Social Feelings are all those which bring us into human relations and lead us to seek the satisfactions which they afford, by some surrender of personal independence and mere self-regard. They are the basis of all that reciprocity and mutual consideration which lie at the foundation of civilized society. The great generic form of social feeling is Sympathy, the ability to put one's self in the place of another and make, in a sense, the feelings of others our own. Kindred to this, is Love, in the higher sense of the word, sexual attraction belonging rather to the self-regarding feelings.

The Higher Sentiments.—The Higher Sentiments are the Intellectual Sentiment, the Æsthetic Sentiment, and the Moral, or Ethical, Sentiment.

(1) The Intellectual Sentiment includes all those feelings which arise with reference to the pursuit or the possession of knowledge, as Wonder, Curiosity, the Pains of Ignorance, and the Joy of Understanding. All these are exhibited by the child in great purity. It is the pain of ignorance which makes of him "an animated interrogation point"; and the dying down of curiosity in later years is an ominous sign which calls upon us as teachers to make careful examination as to our own responsibility in the case. It is the joy of understanding which moves the scientist and the philosopher to devote their lives to the pursuit of truth.

(2) The Æsthetic Sentiment embraces all forms of feeling having relation to Beauty, the satisfaction that we feel in the contemplation of symmetry, proportion, harmony, delicacy, purity, grandeur, etc., and the pain aroused by their absence. It is the starting point of all art, and its development is an important part of true education. Children, as a rule, are responsive to simple forms of beauty, and need only the stimulus of a sympathetic touch on the part of their instructors. "See there; isn't that pretty?" is a word which ought often to be spoken to little children, but always with discrimination. Care should be taken not to stimulate any affectation or pretense of a feeling which is not genuinely felt. The ministry of æsthetic culture to the refinement and elevation of life and its pleasures is a boon of which no child should be deprived through ignorance or neglect.

(3) The Moral Sentiment comprises those feelings which have special relation to conduct and personal responsibility. The primary element is the feeling of *obligation*

or *oughtness*. This accompanies the moral intuition to which reference was made in Chapter XXII, the innate recognition that *some* acts are right and therefore ought to be done. This is the fundamental factor in what we call Conscience, a term very loosely conceived in the popular mind.

Conscience.—Conscience should be distinguished from moral judgment. It never passes on the morality of concrete acts, never decides *what* acts are right or wrong. It comprises (a) The intuitive recognition of a principle of right, above mentioned, (b) The feeling of obligation, or duty, in the presence of alternative lines of action, (c) The feeling of complacency, or satisfaction, over duty done, or of self-condemnation in view of failure in duty. When this self-condemnation, or sting of conscience, becomes acute and persistent, it is called remorse. The hourly question as to whether given acts are right or wrong, moral or immoral, is one for the judgment only, an intellectual question. The so-called moral judgment is simply the judgment occupied with questions of morality, or obligation. In such cases, however, judgment is peculiarly liable to error and perversion through the warping effect of personal desires, the bias of feeling discussed in Chapter XXII. Along with the stimulation and quickening of the feeling of duty, we should therefore attend carefully to the training of the judgment in its contact with questions of personal conduct.

A "tender conscience" involves quickness and strength of moral feeling. A "seared" conscience is a deadness to moral sentiment, induced by allowing appetite and selfish desires to override and smother the feeling of obligation. A "perverted" conscience is only a perverted judgment as to lines of personal duty, and is often the natural result of education. Fanaticism usually results from a combination of intense moral feeling with a traditional

and ill-grounded system of judgments and beliefs, as in the case of the Moslem zealots who follow the Mahdi to rapine and slaughter from religious motives. The quickening of conscience and the training of the judgment are thus both essential factors in the production of moral character. Conscience without intelligence and sound judgment is liable to do much harm as well as good. And the question, Shall I *do* my duty? is not more common or more vital than the other question, What *is* my duty?

Feelings as Motives.—The fundamental fact to be kept in mind by the educator is that feelings are the mainsprings of action, intellectual as well as physical. The relation of feeling to will may best be considered in a succeeding chapter; but we are already prepared to see the importance of developing by every suitable means the social feelings and higher sentiments, so as to hold in proper balance those egoistic feelings which give force and efficiency to action; for "out of the heart are the issues of life."

Children's Feelings.—The emotions of children naturally and inevitably differ from those of adult life in several respects. At the outset, as has already been intimated, they are largely connected with physical activities. Again, they are greatly dependent on presentations, or sense experiences. Sensations, especially very painful ones, give rise to paroxysms of anger and impatience. Agreeable sensations excite emotions of joy and delight. Of course, anticipations of physical pleasure and pain play a great part; but in childhood the representative element is still relatively small, and abstract ideas have little or no power to arouse feeling. This fact, that the basis of childish emotion is so largely physical and presentative, is one of special importance to those charged with the training of children.

It is also important to consider the stormy and tumultuous character of childish feeling. The power of inhibition is weak, since experience is so narrow and there is so little power of representation, or the holding in mind of images calculated to counteract or oppose the present excitement. We cannot, therefore, very successfully appeal to abstract motives or the higher sentiments, but must rather secure inhibition by means of diverting the child's attention to a new set of interesting percepts.

Again, the feelings of childhood are chiefly of the egoistic, or anti-social, type. The saying that "a little child is a little pig," is not far wide of the truth. The child, it is true, has social impulses, and is constantly made conscious of his dependence; but the rise, through cultivation, of steady altruistic feeling and the higher sentiments, is slow and calls for the greatest wisdom and persistence on the part of the parents and teachers.

The appended outline will, no doubt, serve a useful purpose; but it should be recognized that the possible emotions are so numerous, and so blend together in various compound or mixed feelings, that no satisfactory and really scientific classification of them seems possible.

Summary.—Feeling is that aspect of consciousness which, through its tone of pleasure or pain gives value to our experiences.

It comprises (1) Sensations, or feelings of physical origin, due to the stimulation of sensory nerves. (2) Emotions, or feelings of internal origin, which find expression chiefly through the activity of the motor nerves.

The physical outcome of emotional excitement known as expression reacts again upon the exciting emotion, increasing or otherwise modifying it.

Emotions may be classified as (1) Egoistic, or self-regarding, (2) Social, (3) The Higher Sentiments, which are distinguished as the Intellectual, Æsthetic, and Ethical Sentiments.

Conscience should be distinguished from moral judgment; it

includes the intuition of a principle of right, the feeling of obligation, and the feelings of self-complacency or self-condemnation.

Feelings as motives are the mainsprings of action, and therefore their proper cultivation is of the greatest moment in education.

Children's feelings differ from those of adult life in their stormy and transitory character, as well as in being so closely connected with physical activities and presentations.

- FEELING, OR SENSIBILITY
  - 1. Sensations (Of external origin)
    - 1. General—Organic.
    - 2. Special
      - Muscular,
      - Tactile,
      - Thermal,
      - Gustatory,
      - Olfactory,
      - Auditory,
      - Visual.
  - 2. Emotions (Of internal origin)
    - 1. Egoistic or Anti-social
      - Anger,
      - Hatred,
      - Fear,
      - Rivalry,
      - Domination,
      - etc.
    - 2. Social
      - Sympathy,
      - Love,
      - Respect,
      - Reverence, etc.
    - 3. Higher Sentiments
      - Intellectual—love of truth.
      - Æsthetic—love of beauty.
      - Ethical — love of duty.

CHAPTER XXX

WILL

What Will Is.—The mind not only knows and feels; it determines, in some measure, the direction of its own activities. Images arise in consciousness, either sought or unsought, and these call forth feeling, either desire or repulsion, pleasure or pain. These feelings, in turn, incite the mind to further activity, which may, and usually does, inaugurate bodily activity of some sort. Our images and thoughts arouse feelings, and our feelings impel us to *do* things. But the soul has a native energy by virtue of which it may consent or refuse to obey this impulsion of feeling. Indeed, there may be conflicting feelings and antagonistic impulses between which the mind must choose. This power of the soul to consent or refuse and to determine the lines of its own action is called Will. Will may, then, be conceived as the very core of personality, the central, real self, out of which character develops. A good man is thus a man of good will. Will has been defined as "the soul's power of self-direction towards chosen ends."

It must be remembered, however, that the term *will* is used with a variety of significations by writers on psychology. By some, the term is connected with all forms of action, so that, in this sense of the term, all doing involves willing, no matter how mechanical or involuntary the action may be. It is only one step from this broad use of the word to the discarding of

will entirely as a distinct and independent function of mind.

Different Types of Action.—It will be useful, therefore, to take a brief survey of the different types of bodily movement of which the human organism is capable. We have already, in Chapter VIII, distinguished two forms of movement which have no necessary connection with mind, though they may have an incidental result in consciousness. These are:

(1) Spontaneous Action, the aimless movements of infancy, beginning before birth even.

(2) Reflex Action, which results from the external stimulation of nerve ends, and which may be attended by consciousness, but is not necessarily so. To these we must now add:

(3) Instinctive Action, which is, in a sense, reflex, but more complex in character and far-reaching in results. It is directed towards some definite end, but this is not a conscious end, and is generally related to the preservation of the species. The nest-building and migration of birds and the wonderful action of the caterpillar in spinning its cocoon are examples of this blind but perfect working towards an unseen end.

(4) We may distinguish another type of movement as Impulsive Action. Though the term "impulsive" has been used in a variety of significations by psychologists, it will be used here to denote that prompt and unconsidered sort of action which often follows the entrance of an image, with its attendant impulse, into the mind. "I did it without thinking" is the only explanation which the impulsive doer can make of his deed. It is a common type of action with children, and is voluntary only in the sense that it was not resisted; there is no balancing of motives, no consideration of an alternative action. The

man who cannot swim but who without hesitation jumps into the water to save a drowning child, an act without justification in reason, acts impulsively.

Voluntary Action.—We come now to the highest type of action, movements which may properly be called Voluntary, or Volitional, and for which the other forms of action have prepared the way. Here, several elements, or conditions, are to be noticed: (1) A representation, or image, of some possible satisfaction to be derived, (2) The desire excited by that representation, (3) The recognition of an alternative action, (4) Deliberation, or the weighing of opposing considerations. "We cannot eat our cake and keep it too;" which shall be done?

All these conditions must be fulfilled before we come to volition proper. All of them except desire are intellectual activities. Desire is primarily a form of feeling, the feeling of unrest, craving, want; but it is also the border land between feeling and will. It furnishes the motive or occasion on which the will acts.

Volition proper comprises two steps, or phases. (1) The first is that of Choice and Resolve, by which deliberation is closed and the line of action determined upon. Sometimes, the deliberative process is long and painful, and decision is reached with difficulty. At other times, the die is cast with great promptitude. This will be true when intellectual apprehension of all the elements of the situation is clear.

But whenever the point of decision is reached, we enter upon (2) the Executive phase of volition, the choice of means and measures for accomplishing the resolve, and the putting of these into operation. This is the stage of action; but it will be observed that physical activity is only the last and practical step in the whole process. This executive stage, like the stage of deliberation, may

be short or prolonged. The execution of a resolve, indeed, may be long deferred, as the boy's resolve to be a lawyer when he becomes a man. In this case, the stage of resolve may be said to be prolonged; the resolution must be often confirmed, or renewed.

The Development of Will through Physical Exercise.—Will is developed only by exercise. And it can be exercised only in connection with other activities. Its first field of exercise is in connection with bodily movements, the gaining of muscular control. The child at play, learning new movements and coercing his awkward, reluctant muscles into their performance, is taking his first lessons in will-culture. A little later, he will find less agreeable but no less valuable will-training in his daily piano practice, in learning to sew, or to use tools, or in getting more perfect control of his vocal chords and the muscles employed in accurate articulation. Properly planned practice in club-swinging and other calisthenic exercises is of recognized value not only as physical exercise, but also as a mode of will-training.

This value, however, inheres only in exercises that are still imperfectly mastered and therefore demand conscious effort in their performance. When actions, however complex, become easy through the operation of the laws of habit, they lose in a measure their educational value. There is no disciplinary profit in continuing to practice exercises which cost little or no conscious effort.

In teaching children to articulate plainly, to sing, to move promptly at command, and to control their muscles properly in writing and drawing or in the use of tools, we are doing much more for them than simply giving them skill in practical arts.

Development of Voluntary Control over Ideas and Feelings.—Another phase in the development of will through

exercise is connected with the voluntary control of ideas and feelings. The teacher's most important contact with the will of the child is found in its relation to attention. And this is vital not only in the relation of attention to the act of learning, but equally in its relation to character. Control the direction of the child's attention and you control the springs of action. In what is called involuntary attention there is a passivity of will; the act ensues without any consideration of alternatives, in which respect it resembles what we call impulsive action. But when there is division or opposition of interests, the act of choice must be made; and in voluntary attention we have the presence of volition in its strictest sense. The problem, then, is how to secure the right choice and determination on the part of the pupil. From what has already been said, it will be seen that the will does not act without reasons, and these reasons are found in the child's ideals and interests. In short, his feelings and desires, as aroused by his apprehension of things, are the key to his conduct. It is true that his desires are conditioned, in greater or less measure, by his heredity, his constitutional and inborn tendencies; but these do not appear in full force in the earliest years. Here, then, is the opportunity of the educator to shape the ideals and predispose the emotional activities of the child, to arouse and stimulate the higher sentiments, before the heavy hand of ancestry is laid too strongly on the growing youth. What early interests shall we inspire, and how shall we accomplish the result? is our first and perennial question. But, as we saw in Chapter XVI, remote interests are the essential condition of voluntary attention; and it may now be said that all volition implies these remote or far-reaching interests which can be pitted against present impulses. Whatever, therefore, is useful

for the development of wholesome permanent interests is thereby of value for fashioning the will and establishing sound character.

The Establishment of Character.—What has just been said derives its validity largely from the fact that Habit has the same relation to volition that it does to thinking and feeling. Indecision and feebleness of resolve may be, to a considerable degree, constitutional, the result of temperament; but much can be done by proper training to overcome the defect. One means to this end is the throwing of responsibility upon young persons at an early age, so that they shall become accustomed, even in the plastic stage of development, to the forming of decisions affecting important results. The *gamin* on the city streets, through the necessity of looking out for himself, often gets a training of will which is denied to the pampered children of the well-to-do. His fatal handicap lies, however, in the narrowness of his emotional and rational development.

Firmness, or steadfastness, of resolve in the midst of diverting tendencies and temptations is a most important habit of will. This, however, is not the same as obstinacy, which is rather a disease of will than an evidence of strength of will. The common misconception on this point leads to much error in the estimate of individual character. Self-will, or waywardness of character, is usually the result of unregulated and untempered emotions, along with a deficient intellectual appreciation of social responsibility. Moral training, or the training of will, is thus not an undertaking which can be separated in any degree from the training of intellect and sensibility. The soul must be treated as a unit having constant interrelation and interdependence among all its powers. And action is not simply the result of feeling

and knowing, but is equally the occasion and the means by which they come into being and reach their development. It is no accident that the arts always precede the sciences.

Summary.—Will is the soul's power of self-direction towards chosen ends, its power to consent or refuse, and determine the lines of its own action.

We may distinguish the following types of bodily movement, viz.:

(1) Spontaneous action, the aimless movements of infancy.

(2) Reflex action, resulting from external stimulation.

(3) Instinctive action, more complex than reflex action.

(4) Impulsive action, the unconsidered response to images as internal stimuli, and

(5) Voluntary action, the highest type.

Voluntary action is conditioned upon (1) A representation of some possible satisfaction, (2) Desire excited by that representation, (3) The recognition of possible alternative action, and (4) Deliberation, the weighing of considerations.

Volition proper includes two steps, (1) Choice, or Resolution, and (2) Execution. These may be separated in point of time.

Will is developed by exercise and in connection with other activities, especially bodily exercise. In childhood, this exercise consists largely in acquiring muscular control.

The teacher's most important contact with the will of the child is found in its relation to attention, the motives for which are derived from the child's ideals and interests.

Habits of will may and should be cultivated, since these constitute the solid basis of character.

PART III

PRINCIPLES OF TEACHING

In the remaining portion of this book, it is not the purpose to attempt a complete and scientific formulation of the science of teaching. That is a task which still awaits an abler hand; many have attempted it, but the day of accomplishment is still distant. It has been thought useful, however, to attempt a selection of those psychological truths which are generally accepted as past the hypothetic stage and of greatest value to the teacher for the practical guidance which they afford, and to trace out, in each case, their most obvious and unquestioned applications to the art of teaching. It is not claimed that these principles have been arranged in the exact order of either their importance or their scientific dependence; that must be, as yet, more or less a matter of opinion. Yet some attempt has been made to present them in a coherent and rational arrangement.

Neither can the writer hope that he has been successful in tracing and adequately presenting all the pedagogical applications or implications of each selected principle. He has simply taken each in turn as a text under which to advance such practical considerations as seem to him of most direct value to the actual teacher. A secondary purpose to be served by Part III, as was said in the Preface, is to furnish a practical review of what has been covered in Part II. Of course the object of this review

is to put the prospective teacher into a more easy and free command of those psychological truths which are fundamental to his art. The profitableness of such a review to the student has been abundantly demonstrated by the experience of the writer.

Note.—It has not been thought necessary in Part III to close each chapter with a summary as in the preceding parts of the book; but it is recommended that the class be required to memorize, as a review lesson, the "Principle" and the several "Applications" of each successive chapter. These concise formulations of educational doctrine cannot be too firmly stamped into the minds of intending teachers.

CHAPTER XXXI

MIND AND BODY

Principle I.—*Mind and body constitute a partnership. Mental activity is conditioned by brain activity, which is modified, in turn, by general bodily conditions, among which are nutrition and fatigue.*

The pupil should here recall all that he has ever learned elsewhere which goes to substantiate the above propositions, reviewing briefly the facts concerning reflex action, sense-impressions, sense-defects, retention, and the conditions of attention. Let the class also think out, from experience, or otherwise, the various effects of mental states on bodily conditions, as sudden fear, grief, mental depression, joy, etc. In short, the pupil should summon his knowledge of both physiology and psychology to aid in the full appreciation of Locke's famous apothegm, "A sound mind in a sound body is a short but full description of a happy state in this world." And a happy state must first be an efficient state.

Undoubtedly, we shall never have perfection of school work and results until we adopt a system of expert medical supervision of school children and schoolroom conditions. But this, perhaps, implies a new type of education and training for the medical, or sanitary, supervisor. The prescriptions which he should make will not be of drugs, but of gymnastic exercises, of proper distribution of air, light, and warmth; and these prescriptions would often have to be taken by the taxpayer rather than the child.

APPLICATION 1.—*The school must take due cognizance of the child's physical condition as regards sense-defects, important epochs of physical development, and temporary indispositions.*

(1) *Physical Defects.*—The most common and obstructive of the sense-defects liable to be found in the schoolroom are abnormalities of the eye and partial deafness, and the first danger is that the teacher may not discover their existence. Often, a child of dull hearing gets a settled reputation for stupidity, whereas he has never clearly or connectedly heard the words of instruction or the responses of his classmates; and yet the teacher has not suspected the true situation, a negligence on his part which is unpardonable. In such a case, even if the defect be found incurable, much can be done by giving the pupil a seat where he can best see and hear both the teacher and class.

Every teacher should have a training which will enable him to detect the presence of myopia or kindred visual imperfections; and, when discovered, prompt measures should be taken to impress upon parents the importance of seeking without delay the services of the optician. Nothing can be more cruel than to leave such a pupil to struggle on at a disadvantage in his class, and in the world about him, with the added danger of further damage to his eyes through neglect and abnormal strain. Color-blindness should also be tested for, and due effort made to overcome it, or the color-ignorance which often simulates it, by proper exercise in the discrimination and naming of colors in flowers, fabrics, colored papers, etc.

It sometimes happens that children find their way into the lower grades of school who are, in some degree, "feeble-minded" and incapable of instruction by ordinary school methods and appliances. This furnishes a delicate

situation for the teacher, who should, in such cases, seek the aid and counsel of the school officers. The school as a whole ought not to be allowed to suffer from the continued presence of a pupil thus disqualified, however pitiful the case may be. The danger is sometimes a moral danger as well.

(2) *Adolescence.*—Every teacher will be better fitted for his work by as full an understanding as possible of the more important stages in the physical development of children and youth. The kindergartner and primary teacher should study watchfully the physical conditions and handicaps of early childhood. But the most important stage or crisis is that known as adolescence, which begins with the approach of puberty and extends through several years, though its upper limit is not well defined. The earlier years of adolescence, covering, roughly, the 7th and 8th Grades and the first half of the High School, are often unsympathetically alluded to as "the awkward age," "the silly age," and even "the fool age." It is the time in which the boy first comes to a proper estimate of the function of neckties and shoe-blacking.

This is a critical time in the life of every boy and girl. Great physical changes are in progress, and the mind is in a state of "unstable equilibrium"; it is a time of wayward and disturbing emotions. But it is also the period in which ideals are actively forming, and in which the die of life is cast. It is therefore the age of opportunity for the wise teacher, while demanding of him great patience and intelligent sympathy. There is no truer field of usefulness and service than that of the teacher in the "Grammar Grades," for in these grades, if anywhere, are cemented the firm foundations of both scholarship and character, in most cases.

(3) *Temporary Indispositions.*—Pupils are not in equally good condition for mental labor at all times. While the teacher can hardly attempt to adjust his demands to all these fluctuating conditions, he should be watchful to note and regard the more serious instances. The effect of hard colds and influenzas and of nervous headaches, to say nothing of epidemic diseases, makes serious but unavoidable inroads upon the work of the school; while, during the adolescent period, unspoken but watchful cognizance should be taken of the periodic disturbances to which one sex is necessarily subject. This means, of course, that we cannot expect all members of a class to be at all times equally well prepared for the recitation in hand; and measures should be taken, by reviews or otherwise, to distribute and equalize the work over longer periods than the daily unit.

APPLICATION 2.—*The school must furnish suitable conditions for work, such as good ventilation, proper temperature and lighting, desks adapted to the bodies of the pupils, and sanitary school surroundings.*

The detailed study of these physical conditions of school work belongs, as the studies of teachers' training schools are usually arranged, to the subject of School Management, or School Economy. But they seldom receive, even there, the full and careful attention that they deserve. The problem of a proper management of the light in schoolrooms is one that is frequently ignored or inadequately solved. The impositions of our modern civilization upon the eye are so exacting and so unnatural, biologically speaking, that every available means ought to be employed for reducing and mitigating these abnormal demands. The common error of hanging window shades at the top and opening them at the bottom only, is but a single instance of the current ignorance and malpractice.

It is quite as much the true business of the teacher to be watchful about the ventilation and temperature of the room, and cognizant of the flushed faces and heavy eyes which result from disuse of even the imperfect means provided for their prevention or relief, as it is to hear lessons and keep order. It is also the duty of the teacher who is not under close and responsible supervision, as in country schools for instance, to be qualified in point of knowledge to advise school officers as to the best methods of remedying or alleviating injurious conditions in the school environment.

APPLICATION 3.—*The daily program should be so planned as to recitation and study periods, and the succession of various subjects, that the pupil's powers may be duly exercised without unnecessary or excessive fatigue.*

The brain, like the rest of the body, does not work with equal energy in all its parts; while one part of the cortex is at its highest activity another may be comparatively inactive. Great activity of the motor centers, for instance, does not usually coexist with a corresponding energy of those concerned in abstract thinking. "Change is rest" is true of brain activity if anywhere. Again, the nervous system as a whole has times of maximum and minimum intensity, under the law of fatigue. It is greatest in the morning, after the night's rest; it oscillates during the waking hours, but is naturally lowest at the close of the day's work. Some experiments which have been collated seem to indicate that there is a considerable depression of mental energy in school children soon after the middle of the forenoon session—about eleven o'clock—followed by a partial recovery in the afternoon. In the afternoon, attention again flags in the later hours. These facts, and the experience of all observant teachers, point to the practical wisdom of

placing those exercises which demand most severe thinking in the fresher parts of the day, and putting those requiring most muscular activity, like gymnastics, penmanship, and singing, in hours in which the cerebral activity is naturally lowest. Again, study and recitation should alternate in the day's program, though the study and recitation of the same lesson should not be consecutive. The pupil's work should not consist in alternately loading up a lesson and (immediately) unloading it. He should be expected, as a rule, to keep each lesson "on his stomach" a little while before regurgitating it.

Night Study.—A further suggestion, with reference to students of higher grade, may not be amiss. There is much mismanagement among such students of their evening study hours. They are apt to fritter away the early evening hours and then to push study far into the night, after the nervous system has become fagged and jaded. They are often deceived by a sort of fitful and illusory blazing up of nervous excitability late in the night which is both deceptive and injurious, being in some degree akin to the accelerated action of intoxication. One seems then to be thinking rapidly and easily; but the permanent residuum of knowledge and understanding is small. What seems to be learned at those times, when the student ought to be in bed, is unstable and easily effaced, as next day's recitation so often demonstrates. Those exercises which require least of memorizing and reasoning and most of motor activity, such as writing out exercises and translations or practicing oral expression, may be most safely done in what are, or ought to be, the drowsy hours.

CHAPTER XXXII

HEREDITY AND ENVIRONMENT

Principle II.—*Mental Development is due to the constant interaction of (1) hereditary characteristics, and (2) the various factors of environment which the mind selects from the complex whole.*

Heredity.—The principle of uniformity and continuity in nature results in, or includes, the law of Heredity, the transmission of characteristic traits from ancestry to posterity. We may note the distinction between General, or Race Heredity, and what may be called Special Heredity. All men, for example, inherit from their ancestors two legs, arms, and hands, two eyes, the faculty of speech—the race characteristics, in short. More narrowly, each race or tribe, as the French, the Irish, or the Arabs, have physical and mental characteristics which belong to all members of the particular nationality from generation to generation. Plants, too, have their heredity, as in the jointed stems and the knotted joints of the Pink family.

By special heredity is meant the transmission of family traits or of individual peculiarities from father to son, as in the case of the musician Mozart, the Adams family, and those cases of family resemblance familiar to the observation of every one. There is here, however, no such uniformity or reliability of transmission as in race-heredity. And a wide controversy has prevailed in late years among biologists as to whether physical or other

characteristics acquired during the lifetime of the individual are ever transmitted to his descendants, the negative, or Weissmannian, side of the debate seeming to have the advantage at present.

Environment.—By Environment is meant all the surroundings which in any way affect the life of the individual. They may be classified as (a) Physical, including climate, the habitat—whether shore, mountain, or prairie—food, shelter, and occupation; (b) Social, including the family organization, the community life, political and religious institutions, and all forms of education.

It is important to note that environment, both physical and social, may be the same from generation to generation, and thus many results have been attributed to heredity which are really due to what may be called *hereditary environment.* The question of the relative force and influence of these two factors, heredity and environment, has been much discussed during the past generation, one school contending that heredity determines character, and that education counts for comparatively little; the other side holding that heredity can be in large measure, if not wholly, overcome and canceled by an education which begins early enough and proceeds wisely and thoroughly enough. It is well for the teacher's success if he belongs to the latter camp and has an abiding faith in the efficiency of education; yet he needs also to be alert to discover the trend of hereditary influences in each pupil, that he may the better understand the individual problem with which he has to cope.

APPLICATION 1.—*The school must proceed on the assumption that all human minds have, in the main, like fundamental tendencies, and yet that each has his own individual characteristics.*

These racial characteristics, due to general heredity,

furnish the field of psychology. It is for the sake of understanding more clearly what these fundamental human tendencies are that teachers should study psychology—not so much its unsolved problems, however, as its assured and formulated results. This will also render more intelligent and successful that personal study of individual peculiarities which is indispensable to the best teaching.

The term "child study" has thus come to have two current meanings; it is sometimes used to mean the same as infant psychology, while at other times it signifies the personal study by the teacher of the individual child. Both studies are important, and the one furnishes a basis for the other. The study of psychology helps us to understand what the pupil ought to be and to become. Personal study and insight must *find* him, as he is, and fit the work and training to him. If the pupil is abnormal, it is essential to know why and how far; and even the normal child will have his own peculiar bent of mind, which the teacher has need to discover and recognize.

APPLICATION 2.—*All subject-matter, and the method of teaching, must be adapted to the normal pupil, and, at the same time, not fail to find points of contact in each individual, whatever his peculiarities may be.*

Our principle speaks of factors of environment "which the mind selects from the complex whole." No individual mind is responsive to all the elements of its environment, but each has its own special, predominant interests. Why does a particular mind select one class of phenomena rather than another to react upon? The reasons are manifold. It is here that the influence of heredity appears, often giving a bias, or bent, to the mind which strongly determines the propensities, tastes, and interests; the child is "a chip of the old block."

Secondly, at any given stage of development the past experience and environment of the child determine his mental reactions. The principle of Apperception largely rules, by which all new interest and acquisition spring out of the old. We pursue inquisitively only that which we have the mental foundation for comprehending. Along with this law that the new must have its roots in the old, the law of habit also actively conspires. The boy who has been reared on a stock-farm will most naturally be attentive to and interested in blooded cattle or horses, wherever he may encounter them. He will be interested in pedigrees and records, and respond actively to all such elements in his environment; in which a youth of different antecedents, as a fisher lad, would find little stimulus or interest.

The Field of the Teacher.—But heredity, habit, and the apperceptive law combined do not completely foreordain the career of the child. Aside from the potent tendency to individual variation, there is always room for the operation of personal influence. Personal respect, confidence, and admiration, on the part of the pupil, will strongly dispose him to accept the interests of the teacher, whose greatest successes are often won through this power to inspire the youth with his own enthusiasms.

How far shall we follow the special bent or lead of the pupil? Only so far as is necessary to capture his confidence in our sympathetic attitude towards his personality and secure his allegiance. We must strive to bring him, ultimately, to a participation in the normal interests of the race and community, and secure, so far as possible, a symmetrical development and discipline of his powers. We should by no means smother any natural gift; but neither should we, in deference to it, prematurely lose sight of the true ends of education. We may follow the

pupil's bent some distance in order that we may lead him aright in the end; but the normal type must, after all, determine the general trend of our early tuition. Later, his special talents and interests should be given full play.

APPLICATION 3.—*The school must, so far as possible, surround the pupil with such an environment, physical, social, and spiritual, as will secure the realization of his highest possibilities.*

During school years, the school itself is a large part of the pupil's environment, and often a most potent part. This may be seen in the young child in the kindergarten, who is intensely responsive to its influences; but it is most complete in the college life, where the student practically lives in a world apart and is ruled almost absolutely by the college atmosphere and traditions, largely of the students' own making. But, in every grade of school, teachers and patrons should conspire to make the school surroundings not simply sanitary and wholesome but inspiring and influential in stimulating the pupils' intellectual and æsthetic susceptibilities. School decoration and the beautifying of school grounds are therefore matters of the utmost importance, and should be looked after with the highest available degree of taste and good judgment, and not left, as they so often are, to accident and transient impulse. The library and laboratory are important items also, in the school environment. But the most vitally important factor of all is the intelligent, wise, and inspiring teacher. This is the central thought of the oft-quoted remark of President Garfield that "a log with Mark Hopkins on one end and a student on the other" comprised the essential conditions of the educational process.

CHAPTER XXXIII

THE LAW OF HABIT

Principle III.—*All activity, physical or mental, gives rise to certain modifications which tend to persist and form the basis of habit. The extent and permanence of such modifications depend largely upon brain plasticity and nutrition, on the one hand, and thoughtful attention on the other.*

The physical basis of habit and its office in the life of the individual have been discussed in Chapter XXVII. Its relation to the work of the teacher and school deserves more careful attention than it commonly receives. Probably few teachers realize how large and important a part of their work consists in the endeavor to correct bad habits and establish good ones; though all have, perhaps, become conscious of the difficulty of the task.

Application.—*A chief function of the school is the formation of right habits in the early years, the forestalling or elimination of bad habits, and the strengthening of good habits already formed.*

Whatever in education belongs to the realm of habit must be attended to and made secure in the early and plastic years. Neglect here is fatal. Whatever is wrongly started will give infinite trouble in its reformation. The primary teacher needs to give painstaking attention to the physical attitudes of children, to cultivate quietude and poise of manner instead of the squirming, wriggling

habits and uncouth postures so often and unnecessarily tolerated in young pupils. Much of what belongs to good manners, as the lifting of the hat, modes of address, and personal tidiness, should be early made habitual through the vigilance of teacher and parent. On the intellectual side, such partly mechanical processes as spelling, pronunciation, the holding of the pen in writing, etc., should early be reduced to habit; and good habits must be rightly fixed at the outset or bad habits will hold the field.

And right here is where lasting wrong is done to many a pupil through the lack of steady persistence on the part of teachers. The teacher wearies of watchfulness and criticism and becomes intermittent, if not wholly negligent, concerning such very important matters as the correct position of the hand; and so the great majority of children leave school with a bad habit fixed upon them for life, a serious handicap, though the child cannot realize it. In like manner, the teacher tires of criticising the incorrect and uncouth forms of speech which the children learn so early on the street and playground: but habit never tires, and the pupil goes out into life the victim of his out-of-school associations and his teacher's indolence.

Great harm often results from lack of watchfulness at the outset. The swearing habit, the cigarette habit, and similar vices, as a rule, gain their foothold before parents or teachers, have waked up to the danger. And here is reason why all teachers, from the first term of school up, should give daily attention to the children on the playground. The teacher who takes the recess time to work at her desk or attend to personal matters is culpably negligent at a point of danger.

Important Mental Habits.—Of the important mental habits which the school should earnestly strive to incul-

cate, only a few will be specifically indicated. (1) The *habit of thoroughness* in whatever is undertaken is one of the utmost practical value. As Professor Sully has said, the boy should be early trained to thoroughness even in so simple an action as the hanging up of his hat. What we call slovenliness is chiefly due to the slipshod habit of incompletion. "Whatever is worth doing at all is worth doing well" is a maxim which ought to be stamped into the very brain of every child.

(2) Few habits are of greater practical value than that of *exact* and *clean-cut articulation*. It is, indeed, only one form of the habit of thoroughness; but its reflex effect is especially important. Muddy, confused articulation is the fitting accompaniment—an index, if not frequently the cause—of slovenly and muddy thinking. And it is easier to teach correct articulation to a child than to an adult; "a stitch in time saves nine."

(3) To every one who would lead anything but the mere animal life, the habit of *attention*, of prolonged mental concentration upon whatever is allowed to seriously occupy the field of consciousness, is vitally important. Some children seem always to retain the habit of mentally flitting from point to point, like sparrows in a city street; while others live chiefly in a sort of mental mist, in which nothing gets focused or clearly defined.

(4) A fourth general habit of mind is so valuable that mention of it cannot be justifiably omitted, the habit of watching out for and appreciating the beautiful in nature and art as it daily presents itself to our eyes. It is largely through the neglect of teachers that so many people go through life deaf and blind to the harmonies of the material universe. "Having eyes, they see not; having ears they hear not, neither do they understand."

There is no exaggeration, but profound wisdom, in the

words of Professor James, "*The great thing in all education is to make our nervous system our ally instead of our enemy.* For this we must make automatic and habitual, as early as possible, as many useful actions as we can, and guard against the growing into ways that are likely to be disadvantageous to us as we should guard against the plague." The nervous system of the drunkard and opium-eater is the cruelest tyrant; the nerves of the right and self-controlled liver become his safeguard against evil. "If youth could only know!" It seems, on the surface at least, a mysterious dispensation of "Nature," that the time for forming safe, protective habits, or evil, destructive ones, is mainly confined to the period when youthful waywardness is at its highest, while discretion and prudence are as yet undeveloped. "Experience is a good teacher," but a dear one and often a fatally tardy one.

The Teacher's Duty and Danger.—There is perhaps no part of their duty in which teachers fall so far short of real effectiveness as in this matter of the correction and inculcation of habits. This is a work demanding the utmost patience and persistence; and teachers too easily weary and relax effort. And their worst mistake consists, often, in their uneven, wobbling treatment, urgent one day and negligent the next.

The inculcation of good habits should be prosecuted steadily, perseveringly, and intelligently, even though the results accomplished in the way of "book-learning" should thereby be somewhat diminished. The successful establishment of even the four mental habits above named would be in itself a genuine education, a preparation for self-education equal in value to all else that is done in the schoolroom. But the work of habit-forming must be entered upon early, and the danger is that the teacher

will not wake up to its importance till the field is sown with the tares of slovenliness and indolence.

Professor James's Maxims.—In Professor James's admirable chapter on Habit, with which every teacher should be familiar, he formulates certain maxims of great value:

(1) "In the acquisition of a new habit, or the leaving off of an old one, we must take care to *launch ourselves with as strong and decided an initiative* as possible."

(2) "*Never suffer an exception to occur till the new habit is securely rooted in your life.*"

(3) "Seize the very first possible opportunity to act on every resolution you make, and on every emotional prompting you may experience in the direction of the habits you aspire to gain."

(4) "*Keep the faculty of effort alive in you by a little gratuitous exercise every day.* That is, be systematically ascetic or heroic in little, unnecessary points; do every day or two something for no other reason than that you would rather not do it, so that when the hour of dire need draws nigh it may find you not unnerved and untrained to stand the test."

These maxims are framed for the youth, or adult, who is roused to take himself in hand by way of reformation or improvement; but they are suggestive to the teacher of children as well. The first step is to arouse, at the outset, a motive strong enough to excite the necessary effort; the next step is a prolonged repetition of the act under proper conditions and without the nullifying effect of lapses and interruptions. And here the vigilance and patient persistence of the teacher counts for much. The child will never fix the right manner of holding his pen, for instance, who is nagged one day and neglected the next.

CHAPTER XXXIV

THE LAW OF SELF-ACTIVITY

Principle IV. — *The mind develops only through its self-activity. Knowledge and discipline cannot be inherited or transferred from one mind to another, but must be acquired and developed by one's own activity. Any power of the mind grows strong by the activity of that power against appropriate resistance.*

We have conceived of education, from the outset, as development, the unfolding and bringing into fruitful activity of the latent powers and possibilities of the soul. The thought now emphasized is that this development must proceed from within, by the free, voluntary effort of the individual, and cannot be wrought out for it or imposed upon it by any foreign, outside agency. The mind is an organism and, like a plant, it must seek its own nourishment. All that the educator, or gardener, can do is to supply favorable conditions. But as the physical organism requires not only food but exercise, and as exercise always implies some resistance to be overcome, so the mind increases in power only by the overcoming of resistance, the surmounting of obstacles. The lifting of straws would never develop strong, or facile, muscles. The kind and amount of resistance to be set before the would-be athlete is a principal problem of his trainer. So, the making of a course of study which shall present to the pupil the most suitable and fruitful difficulties and discipline is a chief problem of the educator.

Moreover, the pupil who is trained to intellectual

dependence loses much of the best of life. The pleasures of pursuit, the sense of personal power, and the joy of conquest belong only to self-activity.

APPLICATION 1.—"*The child attains to knowledge not by receiving it, but by taking it. He instructs himself. The teacher is the guide, coöperator, and remover of obstructions only.*" —LAURIE.

Pestalozzi puts this in another form of words when he declares that education is only "a continual benevolent superintendence."

We have already met with one phase of the truth that knowledge cannot be transmitted from one mind to another, in our study of the limitations of language (Chapter XXIV). But it may be asked, "If this be true, and the child gains knowledge only by *taking* it, why not dispense with the teacher altogether? Why so great an outlay for schools and teachers?" This question, What remains for the instructor? should be a profitable one to any teacher who rightly answers it. It is the business, and the sole business, of the teacher, (1) *To lay out the work.* The pupil cannot guide himself through the maze of knowledge. He cannot observe the proper order and sequence of acquisition. Some one must provide a curriculum, or course of study. This, it is true, is usually made by the superintendent, and the individual teacher has only to interpret and administer it; but if not, then the teacher must make it. But in the administering of a course of study there is much to tax the judgment of a teacher in the descent to details, that apportioning of each day's task which we call the assignment of lessons. This is a part of the teacher's work, moreover, which is seldom done with the care and studious consideration which the needs of the pupil demand.

(2) *To supply motives.* The self-taught and solitary student finds great difficulty in keeping himself to his work; a difficulty beyond the powers of most youth. And even under schoolroom conditions, with all the stimulus and suggestion of associated effort, the problem of keeping pupils up to their work, in persistent industry, is one that taxes to the full the ingenuity and force of the teacher. The study of school incentives, like that of school hygiene, belongs, properly, under the subject of School Management; yet a brief discussion here may not be wholly amiss.

School Incentives.—The motives which the teacher should strive to arouse and bring to bear upon the pupil lie, as we have seen in Chapter XXIX, in the domain of the feelings. But the various emotions differ in value as educational means. We may thus arrange a sort of gamut, or scale, of school incentives, or motives. (a) At the bottom of this scale we may place, as least worthy, *fear*, the dread of bodily pain. This was the main, often the sole, reliance of the old-time master. A famous English headmaster was asked for the secret of his success in getting pupils through the university examinations, and answered, "I have no secret; I *whip* them and they learn." This is the cheapest of all motives, the easiest to command by the muscular teacher and the first resort of the lazy teacher; whereas, it should be the last resort of the self-respecting teacher. (b) Next above this, comes a more refined form of fear, the fear of mental pain, as excited by sarcasm or unfavorable comparisons striking at the pride of the pupil. This may be much more cruel than corporal punishment. Indeed, the objection to corporal punishment does not lie, in every case, in its cruelty. If it is the most effective or available means of bringing a child to himself, as it sometimes may be, it is then not cruel.

(c) Next, as higher in its degree of refinement, we may name the love of approbation, the approval of parent or teacher. Care must be taken here not to cultivate vanity or egotism unduly; the love of praise is sometimes a dangerous flame to fan. There is reason to think that some teachers employ praise with too little discrimination, while perhaps a larger number use it too sparingly. But there is little danger in appealing to the motive of affection; and many a child will apply himself faithfully from the desire to please the teacher whom he loves and respects. (d) Above the mere love of praise, comes the love of superiority and of power, in a word, youthful ambition. The boy who is conscious of mental power will love to exercise it; the difficulty here lies with those who lack faith in themselves and feel the lack of power, sometimes mistakenly. Here encouragement and tactful effort to cultivate a feeling of ability to conquer difficulty is of the greatest value. How far the spirit of rivalry should be appealed to is a question for the thoughtful judgment of the teacher; but a spirit of healthy and fruitful emulation is always possible under skillful guidance.

Other grades of the desire to excel, as the desire to excel one's own past and mount always higher, may well be recognized; but we pass to the top of our scale. (e) We find here two motives which the reader may exercise himself in ranking, *the love of knowledge for its own sake*, the pure joy of understanding, and *the desire for knowledge and discipline as a means of usefulness to others*. Where these can be inspired or stimulated, the remaining work of the teacher is easy and delightful.

(3) *A Third Function of the Teacher.*—It is a further function of the teacher to *develop in the pupil the power of self-judgment, or self-criticism*. Every man must carry his education to completion, after school days are over, by

the aid of his social environment. For the successful accomplishment of this, he must have attained the power of self-criticism. The self-taught man is always in danger of being a poorly taught man; he is in danger of "knowing too many things that are not so." In order that one may develop this power of judging his own performance as to its success or failure, he must first have been subjected to external criticism, the critical judgment of others. As self-control must have its first beginnings in external (parental) control, so self-criticism must have its roots in external criticism; and the teacher should be, in school years, the qualified and watchful vehicle of this criticism. He must unwearyingly yet sympathetically apply the measuring-rod to the performance of his disciples.

(4) *The Teacher as an Example.*—Above and beyond the conscious work of the teacher, there lies his unconscious influence through example and personal inspiration. The pupil who realizes that education and study have made his teacher a worthy and admirable person will unconsciously surrender himself to the stimulating force which such a personality emits. And thus it is that the teacher should be a beautiful person, physically beautiful if possible, but at least and always, beautiful in manner and in soul. The teacher of selfish, acrid spirit or of crude and unsympathetic behavior must, in great measure, fail to accomplish the highest results, no matter how thorough his scholarship or how scientific his methods of instruction. Thus the crowning office of the teacher is that of inspiration through his own personality. He becomes in himself a motive.

APPLICATION 2.—*The several powers are developed by occasioning the natural activity of each. "Exercise strengthens faculty."*

This law has various aspects. It applies, first of all, to

the development of physical powers. The leg muscles are strengthened by running and jumping, not by boxing; the arm muscles are developed by striking. The blacksmith is not in the way to become a sprinter. Hence the gymnasium director seeks out the weak points of the bodily organism and strives by exercise to determine the nutrition to those parts. Mentally, the principle may be applied to the several faculties, as memory, imagination, reasoning. No amount of exercise in memorizing will appreciably increase the power of abstraction and generalization; and practice in deductive reasoning adds no power to the imagination. But the truth, or validity, of the law will be best apprehended if we apply it to the several so-called talents, or special aptitudes, as musical talent, talent for mathematics, for languages, or for physical science. He who would increase his power in mathematics must exercise himself in mathematics—the study of language will not do it; on the other hand, the weakness of mathematicians in linguistic expression is proverbial. Again, a person of considerable native musical capacity may allow it to remain dormant through exclusive devotion to the development of other talents. Drawing the lines somewhat more closely, it seems to be recognized as pedagogical truth that patient attention to the study of grammatical forms and constructions adds little if anything to one's power of literary appreciation, while exercise in deductive reasoning, as in geometry, gives no increase of power for the inductive investigations of modern science, as in biology.

The question may fairly be asked, however, "Is there *no* interaction? Does not the pursuit of any one study give a discipline of the mind as a whole which results in increased power for attacking any other study?" In answering this query, the analogy of physical exercise may

again be useful. The blacksmith, hammering at his anvil, develops a powerful arm, out of due proportion to his lower limbs; but, at the same time, he improves his general circulation and his digestion by his labor, and gives his whole system a tone which idleness could not induce. So the student of a special subject may, by energetic application to it, induce habits of mental industry and close application which will serve him well whenever another subject is undertaken. It is only in this indirect and general way that the exercise of one power can aid in the strengthening of another.

The practical application of all this yields the maxim, *A suitable variety of studies should be provided at all stages of the school course.* Otherwise, the pupil will become mentally lop-sided and the ideal of harmonious and well-balanced development of the mind will have been thwarted or abandoned. The fact that a pupil is weak in, and therefore disinclined towards, a given subject, as grammar or arithmetic, so far from being a reason for neglecting or omitting that study, is rather, within limits, a reason for increased attention to it. The boy with weak leg muscles does not *wish* to run and jump, but he *needs* those forms of exercise most. But the question of how far and how long the effort to tone up weak powers and secure symmetry of development in each individual case should be persevered in, is one that cannot always be answered by general principle, or rule.

Specialization in Studies.—A further practical problem arises in the matter of scholastic and professional specialization. The race needs specialists, but not a world of specialists. And the specialist should not specialize too soon. The great cranes along the docks of the East River, whose long arms swing heavy freight from the holds of the ships to the wharves, must have strong

foundations—out of sight, below the surface of the water, but broad and deep. They are not simply spars stuck in the mud of the river bed. So the specialist needs, first of all, an all-around foundation of general knowledge and discipline, or his special knowledge will be rendered useless and fallacious by defect of judgment. How far should this general preparation be carried; how early should students be allowed to specialize? This is an important question; and it brings after it the whole question as to the wisdom of our tremendous trend, in this generation, towards special courses and elective studies. That discussion cannot be entered upon here at any length; but the present drift towards the introduction of "electives" into even the secondary schools would appear to be going beyond the limits of wisdom or safety. It seems to be a good example of the American tendency to carry new movements to dangerous extremes.

APPLICATION 3.—*The pupil's preparation should be independent of assistance from other pupils. Thinking is individual. Partnership study results in lack of concentration, of self-reliance, and of mental assimilation.*

The pupil who is true to his own interests will not allow a classmate to assist him in the preparation of his lessons. But few pupils seem to appreciate this; they do not realize that in mental development, as nowhere else, "every tub must stand on its own bottom"; or they lack the earnestness and singleness of purpose which would lead them to observe always the conditions of success. Thus we everywhere find pupils seeking assistance from each other. "How did you work this example?" "How do you translate this passage?" are, in school, the daily appeals of the weak to the supposedly strong, made, strangely enough, without shame or recognition of the tacit confession of inferiority. Members of the same

class in geometry or Latin get their heads together, furtively perhaps, and "pool their issues," making their individual contribution of guesses and experiments, with endless digression and waste of time and opportunity, under the delusion that they are "getting their lessons together." They fail to see that instead of really concentrating their minds under the strong tension necessary to any increase of power they are actually preventing such tension and trying to substitute sociability for individual effort, a suicidal endeavor.

The Folly of Partnership Study.—Partnership study is, in fact, not study at all, but, in most cases, an illusive attempt to escape from the necessity for study. The fallacy of this attempt may find suitable illustration in the field of physical development. No puny youth can profit by the muscular exercise of another. The anæmic girl who needs more adequate nutrition cannot help her case by inducing classmates to help her eat her dinner. If she cannot eat it herself, she can get no possible good from the digestion of others. And so the self-respecting student's motto might well be, "Never ask any one to help you eat your dinner; never allow any one to help you get a lesson." Even if study be taken in the light of medicine, bitter but the least of evils, one must still take his own, and not seek relief by proxy or by partnership.

The Causes of Partnership Study.—The unwise and self-deceptive practice of many pupils, above described, and familiar to all teachers, can be accounted for in many, if not most, cases by consideration of the false views which they have somehow absorbed of the real end and purpose of the recitation, due, perhaps, to the emphasis which is so often laid on "marks," or "standings." These marks seem to them to be the chief end of the

recitation. They prepare themselves, too often, simply to get past the teacher, to meet his demand for answers. They fail to see—and the fault may have been the teacher's—that the real demand is for individual thinking, for *mental tension*, in the recitation as well as before it, and not merely for correct answers. They fear to make mistakes or bring mistaken results and processes to the class-room, because mistakes cause low standings—failing to realize that a most fruitful mode of advance is *by making mistakes and finding them out.* It is really far better that a pupil should bring to recitation mistakes of his own making, than correct answers begged or borrowed from others, perhaps on the stairways to the recitation room. The moral aspect of this matter is seldom sufficiently considered by either pupil or teacher. No moral delinquency is felt in the offering of borrowed results. And the supreme value of mental independence is as little considered. There is only now and then a pupil who feels a healthy scorn of the mental dependence and pauperism involved in getting assistance from fellow pupils. The majority fail, for some reason, to see that the recitation is the pupil's opportunity to prove to the teacher and to his classmates, and above all to himself, his loyalty to his calling as a student and his trustworthiness in the discharge of self-rewarding duty.

The Virtue of Self-reliance.—Self-reliance is a chief virtue of the student, and he should be trained to resort always to his own internal resources, to use constantly what he already knows instead of what somebody else may know. Thring, in his "Theory and Practice of Teaching," says that "a fool is one who does not use the sense he has got." Many teachers, to-day, would seem to be engaged in training up a generation of fools, under this definition.

The question will naturally be asked, "Should the pupil, then, never receive assistance from any one? Will not this denial result in discouragement and consequent failure?" To this, the answer is that the *teacher* is set for the guidance and assistance of every pupil; he is the "guide, coöperator, and remover of obstructions." The pupil who needs more assistance than he can get in the recitation time should seek the teacher personally, and should be encouraged to do so at proper times and within proper limits; though some teachers go to the extreme of weakening pupils by too much coddling. The wisdom of the competent teacher will be nowhere more manifest than in his management of this very matter, the skillful direction and shaping of his suggestive assistance to individual students who may think themselves in need.

APPLICATION 4.—*The recitation is for the sole benefit of the members of the class, and each member should be allowed to reap the benefit. The pupil, not the teacher, should do the reciting.*

The "lecture system," handed down to us from the pedagogical darkness of the Middle Ages, would seem to be a violation of all the laws of mind when applied to any except adult students of already tolerably well-trained minds. With young pupils, the sustained and continuous lecture is an impossible plan; but many teachers substitute for it a more informal and less thoroughly wrought-out monologue, which is scarcely less objectionable. They are so impatient of the pupils' slow and bungling effort at expression, and sometimes so full of newly acquired knowledge themselves, that they lack the virtue of mental continence, and do, themselves, the reciting which is the pupil's right as well as duty. This loquacious habit, which is the curse of so many classrooms, is almost incurable when once formed; the young teacher,

therefore, should guard against forming it "as he would guard against the plague," for it defrauds the pupil of his very birthright. The pupil who knows that the teacher will relieve him from all necessity for organizing his subject-matter to the end of sustained expression, and let him off with mere signals of assent, has little motive for either the preparation or the expression; and without these his time is mainly lost.

When the Teacher Should Talk.—There is a time when the teacher should talk, by way of supplementing or verifying the work of the class; but that is only when the resources of the class have been honestly exhausted. And even then, the help should proceed largely by way of suggestive but concise interrogation. The art of questioning is a great art, but not so easily acquired as the habit of inundating the class with talk. The familiar maxim, "Never tell a child anything which you can lead him to find out for himself," may be too sweeping in its terms; but it is right in its underlying principle, "The mind develops only through its own activity." Two things, therefore, are of vital importance in the teacher, namely, skill in questioning and patience to wait for the pupil's slow and feeble thought to crystallize into expression. The "talkee-talkee" teacher attains to neither of these virtues and, therefore, to no reasonable degree of successful result. It would not be unfair, in most cases, to measure the power and value of a teacher by the inverse proportion of his verbal output to that of the class in hand.

CHAPTER XXXV

THE LAW OF DEVELOPMENT

Principle V.—*The unfolding of the mental powers proceeds in a definite, natural order from infancy to maturity. This order and sequence the educator must apprehend and observe in order to accomplish his ends.*

This principle, like the law of self-activity, is capable of application on different planes with equal truth. (1) To the development of the several faculties. Sensation and perception come first. We must perceive before we can reproduce, and reproduce before we can imagine. Presentation and representation must both be in full play as the condition of conception. Judgment presupposes concepts; reasoning presupposes judgments, and deductive reasoning is not possible till induction has furnished its generalizations. "Every new movement of mind presupposes all the prior movements and carries them with it"—*in* it, we might say.

None of these activities, however, can rise high in its development without the supervening of those which come logically later. As we have seen, judgment enters into perception even, and all the powers are inter-related. It would be a serious error, therefore, to attempt to push the training of the perceptive faculty far to the exclusion of the succeeding activities Nevertheless, there is a blossoming time, a period of special and new-born activity,

coming on in due and natural succession, for each of these so-called faculties; and the teacher must take cognizance of these epochs both as to the content and method of his teaching.

(2) To the order in which the branches of knowledge shall be taken up, and to the arrangement of the subject matter within those studies. Here we have two aspects, (a) *the psychological*, which takes cognizance of the laws of mind and the child's present stage of development, and (b) *the logical*, which is concerned with the logical dependence and order of segments of knowledge, as of algebra to arithmetic, of mediæval to ancient history, or, more specifically, of the later theorems in geometry to the earlier ones. It is by the correct application of our principle in these two lines that courses of study are properly constructed, the imperfections of our present courses, whatever they may be, being chiefly due to our imperfect knowledge of the child and the deep-lying laws of his normal development. Thus it is that Dr. Dewey and so many others are deeply dissatisfied with existing educational procedure. The reader is advised to read carefully and critically Dewey's "School and Society," in order to a fuller understanding of the principle under discussion.

(3) The principle of development has relevance also to the presentation of what might be called the individual items of knowledge, as in the teaching of specific topics, or single lessons, in any field of knowledge. In this connection, certain familiar and generally accepted pedagogical maxims will be considered later on.

It may be said here that the term *maxim* is used in this book as meaning a practical rule for applying a principle. Principles, when formulated, state what is *true.* Maxims *tell us what to do* in conformity with principles.

APPLICATION 1.—*All educational means and measures should harmonize with this natural order of development. All teaching should be adapted to the capability and condition of the taught, both in matter and method.*

It is a blind and astonishing neglect of this truth which characterizes the education of the Middle Ages, a neglect which, by the way, practically reaches down to the eighteenth century in its relation to childhood and early youth. In fact, until the days of Comenius and Rousseau, no real education was ever proposed for children—nothing more than practical training for the social relations of the family and the community. And in this, civilized Europe had made little advance upon the training of barbarous tribes. Children were not thought to be capable of intellectual education; and, indeed, they *were not* capable of profiting by such education as had then been devised, whether in the subtleties of Scholasticism or the classical training of the Renaissance

Periods of Development.—This would seem to be the proper place for a brief setting forth of some attempts at a division of the school period of life into periods, or zones, of development. No precise or sharply defined limits can be set to these periods, but they may be recognized as five in number, namely, (1) The Period of Infancy, extending from birth to perhaps the end of the fourth year. In this stage, the muscular coördinations are comparatively few and imperfect, though, of course, constantly increasing in number and perfectness. The mental experiences of this stage are vague and elementary, as we have seen in Chapter V. During these years, the child learns to walk and talk; but the period, even to its close, is marked by helplessness and physical incompetency. It is a sort of vegetative period, in which the mind is largely passive and receptive, quickly respensive

to outward impressions, volatile, and especially marked by the play of fickle and often stormy feeling, emotional squalls, so to speak. At this time, the nurse, the parents, and "Mother Nature" are the child's educators.

(2) The Period of Early Childhood, reaching on to, say, the eighth year. The time of infantile helplessness is, in a measure, past; the child has greater command of his motor mechanism and greater confidence in his own abilities. He grows venturesome and more inventive in his play. His brain acquires greater consistency, so to speak, and the power of retention, as we have defined this in Chapter XVII, rapidly develops. The love of spontaneous activity is the most prominent characteristic. This is the age of the Kindergarten and the Primary School, where direction more skilled and more systematic than that of the parent may profitably be called in to supplement, and oftentimes rectify, the training of the home.

(3) The Period of Later Childhood may be defined as extending from the end of the eighth year, roughly speaking, to the age of twelve. The child in school during this period is usually found in the intermediate grades, say from the fourth to sixth inclusive. Here the command of language, both spoken and written, has developed considerably, and the pupil enters upon the course of book instruction. In its use of books and in the methods which may wisely be employed, this period differs more from that of early childhood than from the period which follows.

(4) Youth, or the Period of Adolescence, extending forward to the age of physical maturity, which falls, perhaps, between the ages of eighteen and twenty-one, varying according to sex, nationality, and other conditions. The characteristics of this period have been discussed briefly in Chapter XXXI.

(5) The Age of Maturity, with the majority, lies beyond school years, and is the period of active life. To the student it is the college and university age. Here the lecture method may be employed, if anywhere; and the student is able to enter upon lines of *quasi-original* investigation in the laboratory or the library. It is the transition period from school to professional life, and is usually marked by the withdrawal of restraints which have hitherto been needful.

It would seem that even the dullest comprehension must recognize that each of these periods of development should receive intelligent recognition in the planning of courses of study and in the methods of instruction employed in their administration. Yet the period is not far remote when all recognition of the nature of childhood was as yet undreamed of, and only two periods, at most, were recognized, those of the grammar school and the university.

IMPORTANT MAXIMS

For the application of the law of development to the details of educational work, as intimated on page 254, several important maxims have been evolved, which have sometimes been dignified, inaccurately, as independent "principles." The first and most comprehensive of these is familiar to every teacher, viz.: (1) "*All teaching should proceed from the known to the related unknown.*"

Yet to many, it is feared, this is only a form of words; any effort on their part to adequately illustrate its application would result only in failure. A few simple illustrations are therefore offered here. The first effort should always be to find points of contact, to discover what images, or ideas, already within the child's experience can be drawn upon in the construction of the new ideas or

judgments. If I wish to give a child who has never seen a swan, for instance, an idea of what the word stands for, I must begin, by questions, to search his mind for the needful materials. "Have you ever seen a gander?" If so, I may proceed to modify the image thus evoked by stating in what respects swans differ from ganders. If the child has never seen a goose, then I must make further trial to discover the "related unknown" in his experience. "Have you ever seen a duck? A big, white duck?" and so on. In like manner, if I would develop the idea of a magnolia tree, I must begin with the appeal to the child's experience, "Have you ever seen an India-rubber tree (as a house plant)?" If not, a hickory tree may serve. For giving an idea of the magnolia blossom, water-lilies may serve as the starting-point around which to gather, by discrimination and assimilation, the proper elements.

If it be asked, Why should we always proceed from the known to the unknown? the answer is, "Because we *must;* the human mind is "built that way," and we have no alternative. Teachers who attempt to disregard this rule simply waste their time. The lamentable thing is that they do it so unconsciously.

(2) *In all teaching, proceed from the concrete to the abstract.*—Here, again, every teacher knows this maxim as a form of words; but many would be nonplused if asked to define the terms "abstract" and "concrete." Concrete does not mean material. A pear tree or a hammer is a concrete object; but so is a mental image or a burst of anger. We talk about "concrete examples," but all examples are concrete. Concrete means *individual*, particular; while abstract means *general.* An "abstract idea" is a generalized idea. "In the abstract" means *in general*, as opposed to *in particular*. It may be

conceded that the philosopher can draw a distinction between abstract and general; but to the lay mind the distinction does not exist. To the teacher, the terms are convertible.

The concrete belongs to perception first of all, and afterwards to memory and imagination; the abstract belongs to conception and reasoning. Pestalozzi foreshadowed this maxim when he said, "It is a chief business of education to pass from distinctly perceived individual notions to clear general notions," and Comenius realized the same truth long before. This maxim is, thus, the same thing as "From the particular to the general."

For illustration, the concept *line* is a pure abstraction, purely subjective; it is derived by abstraction, from visible marks. The teacher must begin with marks on a slate or blackboard, the ruling on writing paper, etc., and mentally eliminate the element of breadth and consequent visibility. *Parallel* and *meridian* are highly abstract concepts. North and south, east and west lines are only one degree less so. The child must begin with the concrete, as north and south fences, streets, etc. The child may observe a north and south wire fence, imagine it reduced to a single wire, imagine the wire extended around the globe, and then imagine it reduced to an invisible fineness. He gains his idea of *government*, for another example, from concrete manifestations of control which demand his obedience, first, to his parents, then, successively, to his teacher, the policeman, the regulations of the postoffice and the public parks, and, finally, the tax collector. From these varied contacts, he abstracts gradually his idea of government in general.

(3) *In all teaching, proceed from the simple to the complex.*—More or less confusion of mind exists among teachers with respect to the meaning of the term

"simple." We take it to mean the *easy*, contrasting simple with difficult; but what constitutes difficulty in learning? The child may call a long lesson "hard," or one which involves new ideas. But we shall do well to follow the wording of the maxim, and regard complexity as the fundamental factor of the difficult, and analysis as the instrument for resolving difficulty into simplicity.

The pupil who would comprehend complex sentences must first understand clearly the nature of the simple sentence. If he would "see through" a complicated machine, as a rotary printing press, he must first be acquainted with the elementary "powers" of mechanics, the lever, cam, wheel and axle, etc. Knowing these, he must synthesize them into the machine. The savage, before he can at all comprehend what a library is, must arrive at an intelligent conception of a printed page, or, indeed, *a written word*. That symbol is the "simple" from which he must start to reach the complex idea of a library, or of literature; and the road is long.

A Further Important Maxim.—But, often, the child encounters the complex before he is ready for it, before he knows the simple which underlies it, and is baffled by it. Then his only course is, by analysis, to work back to the simple elements and master them one by one. The necessity for this has doubtless given birth to the maxim, "*One thing at a time*," which means, so far as it has any validity, that the elements of a complex must be mastered successively and not simultaneously, as in the example of the printing press given above. Another important maxim, generally obeyed in construction of text-books, but less familiar to teachers at large, may well enough be appended here; though its relation to Principle V may not be so obvious as with the preceding maxims, namely:

"*Proceed from the unqualified to the qualified.*" That is, make the general rule, or law, thoroughly familiar before attempting to deal with its exceptions. An excellent illustration may be found in the proper teaching of the rules of spelling. Many teachers make the mistake of plunging the pupil at once into confusing exceptions, before the rule is clearly held and applied. No wonder the pupil comes to distrust the value of such rules, when he has been thus mistaught. An elaborate example may also be seen in the old Latin Grammar (e.g. Andrews & Stoddard) with the "rule" in coarse print and its array of "remarks" in fine print. And there was a day when pupils were compelled to memorize those uncomprehended pages *verbatim*, without waiting for the rule to be grasped, through the concrete, with any degree of intelligence or familiarity.

For simpler examples, with young children, we do well to teach them at first that the earth is a sphere, without any qualification, and bring forward the flattening of the poles at a later stage. In fact, we usually bring it forward so prematurely that the child's last condition is worse than his first; and he goes through life with an exaggeration which is farther from the truth than unqualified sphericity. Again, we properly teach him that the sun rises in the east, and leave to a later time the truth that it rises exactly in the east only twice a year. In teaching civil government, we teach the three departments, legislative, executive, and judicial, under unqualified definitions at first, and leave their inter-relations and mutual limitations to be added after the fundamental distinctions have become clear and familiar. We cannot teach the whole truth at once; and the pupil must, in a sense, learn some things which he will have to unlearn, or learn differently, later on.

Application 2.—"*Appeal to the instincts as they ripen: strike while the iron is hot.*"

As has been said already (Chapter XXVIII), each instinct has its blossoming time, when it ceases to lie dormant, and comes into activity often somewhat suddenly. If the impulse is not given scope and opportunity for expression during this time of pristine activity, it may be suppressed and die out altogether. Thus there comes a day when the infant is internally moved to walk and he begins walking. No amount of parental urgency or suggestion has sufficed to hasten that effort; but when the time has come, all that the child needs is opportunity and time to perfect, by practice, the requisite muscular coördinations.

Similarly with the act of talking. When the impulse to talk blossoms out, the effort begins and not before, no matter how great the maternal impatience.

The boy who discovers an impulse to use tools, for instance, should be indulged and provided promptly with means for gratifying his desire to "tinker," nor should he be left without needed assistance and direction. So with the instinct to make collections, of postage stamps even. The value lies not in the resulting collection, but in the strengthening of what may develop into a true scientific interest.

Every child in a civilized environment develops at an early age the desire to read for himself. The definite appearance of this desire is the "psychological moment" for commencing the process of teaching him to read. If neglected, a period of indifference may follow, when the work may be much more difficult for all concerned. The recent fad of holding children back from school attendance till they are seven or eight years of age has doubtless resulted in harm, in many cases, through neglect of this

principle. The child passes the moment of desire and "gets out of the notion" of going to school. "Strike while the iron is hot" is an adage which has significance to the educator in many relations.

CHAPTER XXXVI

THE LAW OF INTEREST

Principle VI.—*Attention, the indispensable condition of all mastery, follows the lead of interest and is steadied and given purpose by it. Voluntary attention sets the mind to the performance of a given mental task; but involuntary attention holds it to the work.*

The concentration of mental activity is a paramount condition of acquiring knowledge or skill. No mental experience that does not command attention leaves any permanent, usable result. Fickleness of attention is natural to the young and immature, but in older persons it is a sure sign of weakness and should receive careful attention. With all pupils, and at all times, the great task of the instructor is that of securing proper attention to the matter of instruction. The activity of the mind, at any moment, is exercised in the direction of its dominating interest, immediate or remote; therefore teaching cannot be successful in the highest degree unless the interest of the learner centers in the subject under consideration. A chief problem of the teacher is therefore the problem of interest.

"Since self-activity is the basis of development, willing the source of self-activity, and interest the most powerful motive to willing, it is clear that the quantity and quality of development will largely depend on the force and nature of the interests which affect the individual" (Holman, Education, p. 122). Says the same writer, "Inter-

est is both a cause and an effect of knowledge. The original interests urge us on to acquire knowledge, and when we have obtained it, there is generally a desire to obtain more." Interest is an end in itself; it is at once a satisfaction and a desire; it grows by what it feeds on. And so it is a mere matter of economy that the teacher shall strive to arouse and sustain interest in all that he feels it necessary or profitable to impart.

From Herbart, the great apostle of interest, we have the division of interests into two classes, those connected with knowing, interest in the objective world, and those connected with sympathy, interest in the subjective experiences of others. The interests connected with knowing may be again classified as (a) the empirical, the interest which one has in experiences as such, in the phenomena which surround him; (b) the speculative interest, our desire to apprehend and comprehend relations, order, cause, law, system; and (c) the æsthetic interest, the attraction and impulse of beauty in all its aspects and forms. All these interests have incalculable value, and all, in turn, should be utilized and played upon by the successful teacher. Nor are the sympathetic interests to be overlooked or neglected. They also may be discriminated as (a) the human interest, a sympathetic impulse towards other human beings as such, (b) the social interest, the feelings of desire and obligation which bind us together as members of a community; and (c) the religious interest, which leads us to seek for an understanding of our true relation to the Higher Power whence all this world proceeds. It is only through the due stimulation and cultivation of these interests that we can hope to attain that ultimate end of true education, the realization of worthy character.

It has been pertinently said that a chief end of educa-

tion is the multiplication of interests, that is, the development of interest in all the aspects of the universe and all phases of life, individual or social. All this is implied in the ideal of complete living. Many-sided interests mean breadth and not narrowness of life. It is the teacher's blessed privilege to be continually widening the mental horizon of the child by the awakening of manifold interests.

APPLICATION 1.—"*Interest is the mother of attention, attention is the mother of knowledge; if you would win the daughter, make sure of the mother and grandmother.*"

—JOSEPH COOK.

Interest, as we have seen in Chapter XVI, is feeling, any form of feeling which calls forth the effort of attention. It is aroused by a proper relating of the novel and the familiar. Its importance as the internal stimulus to mental exertion is perhaps sufficiently appreciated; the difficulty lies in its utilization. Probably no tyro ever left home to enter upon the work of teaching without receiving from some kind mentor the injunction, "You must make your work interesting"; but who ever received, at the same time, any usable advice as to *how* to make it interesting? And yet that is a matter which ought not to be left in every case for individual and experimental discovery.

A common mistake is made in not realizing that the effective interest must center in the subject studied and not in the manner of the teacher. Pupils are, doubtless, often interested and amused by the "performances" of the teacher, but such interest tends to divert and distract rather than to energize the mind. The pupil must, somehow, be led to forget the teacher and himself in the work, in the topic and the play of his understanding upon it. A few practical suggestions are offered in answer to the question, How interest pupils in the work?

(1) *Make the work suitable.* This applies both to the matter and the method of presentation. Nothing will more surely destroy interest and discourage exertion than the presentation of matter of such a sort that the pupil cannot assimilate it by any effort, or by a method not suited to his stage of development. The Epistle to the Hebrews, intensely interesting to the theologian, could by no possibility enlist the interest of the infant class; but to attempt its use with them would be little more absurd than the practice, not long obsolete, of cramming boys with all the detail of the Latin Grammar before they knew any Latin. These extreme examples, however, are not without counterpart in some modern teaching.

(2) *Make the work as concrete as possible.* This is, in fact, only one way of making work suitable. But no student ever gets beyond the need of concrete exemplification, not even the university student of psychology. What the pupil can find individual examples of will more surely interest him than that which is as yet veiled under abstractions, simply because it is intelligible. When the facts are clearly apprehended, then he will be interested in generalizations. "From the concrete to the abstract" is a law of interest. The concrete example which is not fully comprehended is a challenge to analysis and the effort of comprehension and classification.

(3) *Have enthusiasm yourself.* This might be called the Law of Emotional Contagion. The contagiousness of feeling is a matter familiar to every observant person; and the importance of this principle in the schoolroom cannot be exaggerated. The teacher who "hates children," teaches only for the hire, and has no enthusiasm in her daily work, is the most dismal and deplorable of failures, no matter how long she may succeed in "holding her job"; while even the "schoolroom crank," who has a

live enthusiasm in some line of study, whether it be "bugs" or poetry, will be almost certain to stimulate his pupils to active effort in that direction. And one condition of this enthusiasm on the part of the teacher is a thorough acquaintance with the subjects taught. The specialist, with all his narrowness, has at least this advantage in teaching, that he is an enthusiast. And the teacher who cannot develop a contagious interest in the subjects he teaches, should turn without delay to stenography or to life insurance, "the bone-yard of schoolmasters."

(4) *Lead the pupil to discover new relations not before suspected.* This is the principle of intellectual surprise. Any one who finds a new and deeper stratum of meaning in what he had thought himself already to have apprehended, or who newly discovers a relationship of which he was previously oblivious, feels a glow of satisfaction which is a wholesome stimulus to further exertion. The joy of insight invigorates the mind and makes it eager for larger conquest. Herein is the peculiar advantage and opportunity of the teacher of Reading in the grammar school or of Literature in the secondary school.

(5) *Encourage persistent application* as a condition of victory. We should never forget that attention may become the mother of interest. "All beginnings are difficult"; but the pupil who can "hold his face to the grindstone" tenaciously will, after a short time, begin to feel the grit of interest take hold and cut away the obstructive dullness. The first chapters of a novel, even, as with those of Charles Dickens, require persistence; we must dig through them, and the reward may be a consuming interest later on. As we are often reminded, one object of education is to develop the power of overcoming difficulties. As a means to this, the pupil must

be assisted in every wise way to gain the ability to grapple with the uninteresting for the sake of future rewards. But this really means regard for remote interests of moment; and the genius of the teacher will find a worthy field of exercise in this direction of helping the pupil to rightly apprehend and appreciate the importance and value of these remote interests which are the basis of voluntary attention.

APPLICATION 2.—*The mind acquires more readily and permanently under the stimulus of pleasurable feeling.*

As applied simply to the depth of impression which is the basis of retention, and so of memory, it may be questioned whether pleasure has any advantage over pain. The Siberian surveyors who secure public remembrance of their landmarks, which are only mounds of earth, by gathering all the boys of the nearest hamlet and flogging them soundly, each in turn, upon the mound, have somehow fallen upon a sound psychological principle. We doubtless remember intense suffering under peculiar circumstances more clearly and with firmer associations than we do great pleasures. And pain has unquestionably a function in education. Socrates perceived this when he called it a "gadfly." The pain of temporary failure is often the most effective stimulus to greater exertion.

But the dislike of pain is not a healthy or reliable means of stimulating continuous effort. The power of attraction is safer and more manageable than that of repulsion.

However, there need be, and should be, no effort after intense degrees of pleasure; they are too intoxicating, and interfere, as we have seen in Chapter XXII, with the successful exercise of judgment. The desirable condition is that of a gentle or moderate pleasure, gradually increasing. Even a slight prospective increase of satisfaction

keeps us reaching for it, whereas a paroxysm of pleasure soon exhausts itself. And the pleasure which should be sought is always of the nature which we have discussed under "The Intellectual Sentiment," in Chapter XXIX. It is the teacher's daily duty to stimulate and cultivate these feelings connected with the pursuit and the possession of knowledge, including their negative side, the pains of ignorance.

CHAPTER XXXVII

THE LAW OF APPERCEPTION

Principle VII. — *Development, intellectual, emotional, and volitional, proceeds through the interpretation of new experiences in the light of those past experiences which have been assimilated.*

Our mental present is dominated inexorably by our mental past, especially those parts of our past which impressed us forcibly and so commanded our attention. These past impressions have become organized into a system of ideas which, so to speak, lay hold upon all new experiences and assign to them a place among themselves, incorporate them into the system. This domination of our past over our present is evidently a most important principle to the educator. Under the name of Apperception, it has been made the cornerstone of the Herbartian pedagogy.

What Apperception Is.—Apperception is by no means a distinct and elementary type of mental activity, like those we have considered in Part II, but is, rather, a compound of activities, involving more especially those of Retention, Association, and Imagination. It is through these processes that our past experience exerts its rule over all new experiences. In another way of looking at it, apperception is the common element in perception, conception, and judgment, namely, the relating activity. Apperception is interpretation. But interpretation is not a simple process; it involves, as said above, retention, association,

and imagination. The particular group of ideas into which the new idea, or experience, is received and assimilated is called the apperceiving group (Apperceptions-masse). Its character is determined, of course, by the nature and amount of past experience.

Apperception Illustrated.—For illustrations of apperceptive activity, let us suppose a wild Indian to be confronted with a variety of pictures. Some of them he could easily interpret in the light of his own life experience, others he would misinterpret, while many he could not interpret at all. They would have no significance, for lack of any apperceiving group to which they could be assigned.

Mr. Roper's excellent little book on Apperception takes for its text the case of a city child who saw a pot of ferns for the first time, and called them "a pot of green feathers." Miss Edgeworth's anecdote of the party of Esquimaux who were brought to London furnishes a case in point. Their chaperons had anticipated great pleasure in their surprise at all the strange sights of the city, but were doomed to disappointment. The poor strangers were only bewildered, and the only thing which excited real interest was a saddler's shop, this being something which they could relate to their own experience; and, at the end of the day, their only comment was, "Too much men, too much noise, too much houses, too much everything." A mass of unassimilated, confused, and therefore wearisome, impressions was all that had resulted.

The same object will be apperceived differently by different persons according to the nature of their previous experience and habits of thinking. A pine tree, for instance, will be apprehended in very different ways by a lumberman, a botanist, a landscape gardener, or a poet. The tree will have a different meaning to each. So a

poem or a musical composition contains for each of us only so much as our past development enables us to see and appreciate. We find in a play of Shakespeare, as has been well said, just what we ourselves bring to it.

The principle of apperception may thus be looked upon as affecting our mental development in two contrasted ways, as positive or negative. From one point of view, it seems to be restrictive; our present is limited by it; we are in bondage to our past. On the other hand, we may say with equal force that our past is the indispensable servant of the present, furnishing the illumination which alone can make it intelligible. It is at once servant and master; the indispensable servant is always master.

APPLICATION 1.—*All teaching involves the proper relating of new material of knowledge to what the mind has already appropriated. To the new by means of the old is the law of learning; and the same is true of emotional and volitional development.*

Understanding comes by relating the new and unfamiliar to the old and familiar. Each new relation established enhances the value of both old and new; the old enables us to interpret the new, and the new enriches the old. An isolated fact or an isolated lesson has no value for the development of the mind.

This proper relating of new knowledge to old involves the use of what we have called the higher laws of association, the laws of similarity and cause and effect. It calls for a much closer correlation of the different studies, or branches of knowledge, than is usually found in schools. The present drift towards extreme specialization on the part of instructors often results in an artificial and injurious separation of studies, a sort of pigeon-holing of the items of knowledge in separate compartments, which is as futile as it is unpsychological. The teacher of natural

science declines to mend the pupil's deficiencies in mathematics, the teacher of history "has no time to teach geography," and all except the language teacher decline to take any responsibility for the pupil's power of accurate expression. Each is so hot after his particular specialty that he forgets the solidarity of knowledge, and imagines that it may run in parallel and separate streams.

Whereas the demands of every teacher should branch widely out to the right and left from the main line which he is pursuing. The teacher of history should be an examiner in geography, the teacher of geography should be a teacher of physics, the teacher of literature should be a teacher of everything else, and every teacher should be a teacher of language. The teacher of any subject will lose no time but increase the permanent usable result of his teaching by knitting his subject on to, and into, every other subject in any way related to it. "United we stand, divided we fall" is also true of the various items of knowledge.

But within each branch, or science, the principle holds with compelling force; and here, again, the maxim, "Proceed from the known to the related unknown" finds its field and its justification.

APPLICATION 2.—*A knowledge of the contents of the learner's mind relative to the subject to be presented, and a clear apprehension of the knowledge necessary to its mastery, is essential to successful teaching.*

Much of the teacher's hard and patient labor is lost or largely discounted from the fact that he has built on sandy foundations. The danger lies in taking too much for granted and assuming that the pupil already has the basal ideas on which the superstructure is to rest, and without which the words of instruction are fruitless and illusory. Here we have need to remember what was set

forth in Chapter XXIV on the limitations of language. We can communicate ideas only so far as the raw materials already exist in the mind of the learner. And the logical dependence of the later steps in each science upon the earlier also relentlessly demands that the teacher shall, in each lesson, know wherewith and whereon he has to build. He must know the exact past result of the pupil's study and instruction before he can proceed safely and intelligently.

But many teachers with good intentions err at this point. Finding the pupil unprepared to receive and assimilate the designed instruction, they put him back to the beginning of the book, for instance, and drag him again over the whole threadbare detail, instead of seeking, by proper testing, for the missing links, or gaps, in the pupil's past work, and proceeding to clear up the hazy concepts which have served as stumbling-stones in his mazy path. How, then, shall the teacher discover the real situation and thus know where to begin? Clearly by tentative questioning and a judicious recall of knowledge which has fallen out of the foreground of consciousness. The mind must be got ready for what is coming by bringing into the present consciousness a full apperceiving group, as much as possible of the system of ideas into which the new thought should be incorporated. And the skill of the teacher will be shown in his ability to do this on each needful occasion without waste of time in desultory or misdirected questioning.

While it is thus necessary for the teacher to discover the actual state of the pupil's knowledge with regard to the subject of instruction, it is equally important that he should clearly understand the subject itself, that he should comprehend just what is involved in its mastery. So he must always confront himself with two questions,

(1) What does this pupil already know? and (2) What still remains for him to grasp in order to a clear comprehension of this subject? Otherwise, he is liable to either of two errors. He may assume too much as already understood, and so build on false foundations; or he may credit the pupil with too little, and so be plying him with a "sucked orange." "What are you learning at school?" said one to a schoolboy. "What I allers knowed," was the disgusted answer. Nothing can be more productive of utter indifference than teaching that which need not be taught.

The considerations here adduced lead us on to

APPLICATION 3.—*The teacher should see that whatever capital the child has on hand is put to use. The net balance of to-day should become the live capital of to-morrow.*

Unused knowledge is knowledge dead or dying. All knowledge which any of us can really claim to possess is that which has been turned over and over in use, use so frequent as to prevent decay. We are stupidly wasteful if we allow knowledge "to rust unburnished, not to shine in use"; and here again we may quote Thring's pithy apothegm, "A fool is one who does not use the sense he has got."

And so to the pupil we must continually, in some way, be preaching this homily: "Always be asking yourself in the face of any piece of knowledge, 'Where have I met this idea before? What do I already know to which this apparently new fact, or principle, bears any relation?' Learning cannot be plastered on to you and power is not a gift; it must grow in you, out of what is already there, and you have got to work for it all the time; the teacher can only *help* you, and I shall be happy if I escape doing you harm."

CHAPTER XXXVIII

THE LAW OF PRESENTATION

Principle VIII.—*The original data of the mind, the raw materials on which all the intellectual powers must exercise themselves, come into consciousness through sense activity. The advance to rich images and concepts is through clear and abundant percepts.*

In the two preceding lessons, we have emphasized the dependence of the mind's present upon its past. This may naturally turn our thought back to the foundations of mental life, the acquisition of the original materials out of which the fully developed and complex consciousness of the educated man must arise. Comenius, the great educational reformer of the seventeenth century, gave lasting currency to the apothegm, *Nihil est in intellectu quod non prius in sensu*, "There is nothing in the mind which was not first in the senses." This declaration, true in an important sense, has been more often quoted than practically elucidated or applied.

APPLICATION 1.—"*In early years, let there be no interference with the freedom of sensation, but rather encourage contact with all forms of existence, and promote the natural activity of the child in every direction.*"—LAURIE.

The vital relation of sense activity to all other mental operations is so evident as to need little argument or discussion. As it is essential to the child's physical development, and the development of volitional control, that he shall have great freedom and variety of muscular activity in early years, so likewise is great freedom and variety of

sensation essential to the culture of his knowing powers. It is much to be desired that parents and teachers might have a clear realization of this, and so of the value to the child's mental life of a wide sense experience. This would include a recognition of the importance to the child's education of travel—country children to the city and city children to the country—of freedom in parks and in the woods, of attendance at fairs and visits to factories and markets. A World's Fair is an event of immense permanent value, educationally, to every child or youth who is privileged to come in contact with it. Indeed, it may be questioned whether the greatest use, after all, of such displays is not in their educational value to the young.

Here, too, we find a strong argument for kindergarten exercises, manual training, school gardens, nature study, and school excursions, as all tending to widen the range of early sense activity, and thus to broaden the foundations of the child's future mental life.

Application 2.—*The primary ideas in all branches of knowledge must be taught objectively in all grades of school.*

In our discussion of the place of Inductive Method (Chapter XXVI), we have already approached this truth. By "primary" ideas is meant those fundamental ideas which lie at the foundation of each science, and which must be developed in conformity with the maxim, "From the concrete to the abstract." The elaborate equipment of modern universities in the way of cabinets and laboratories gives evidence of the general acceptance of this doctrine in even the highest grades of instruction.

Application 3.—*Give the idea before the term and make the connection sure. If the term is given first, make it the starting point for the development of the idea, and take care that the association is firmly fixed.*

This maxim has often been advanced in the unqualified form, "Always give the idea before the term"; but the actual experience of children in learning hardly justifies us in making this an absolute rule. Two things only are essential, possession of the idea and a firm association of this with the word. If these are secured, it does not so much matter in what order. Young children, in the home, are continually hearing new words, whose meaning they insistently seek; but they never use the word until they can attach some meaning to it. But the curiosity which is the salvation of young children seems largely to evaporate after their entrance into school, for some reason that ought to be better understood, and they become content to handle words without clear meanings. And this is the fatal thing. The principal reason, perhaps, for giving the idea before the term is found in the very real danger that learners will be *satisfied* with the word only, and think that their work is done when it is only begun. It is thus that words become "substitutes for ideas," an evil which we have discussed in Chapter XXIV. And this danger is so great and so serious that safety demands a pretty faithful observance of the rule, "First the idea and then the term." Denomination is the *final* step in the process of conception.

CHAPTER XXXIX

THE LAW OF ASSOCIATION

Principle IX.—*The mind's power to recall past experiences, the content of consciousness from moment to moment, and the creative power of the imagination are all dependent, in a great measure, upon the suggestive power of ideas, or in other words, the principle of association.*

The concise statement in the principle above given of the offices of association in our mental life should be clearly apprehended and thoroughly pondered by the teacher. The nature and operation of association have been set forth at some length in Part II and might well be reviewed at this point, especially Chapter XVII. Whether we are wholly dependent upon association for the rise of images in consciousness, whether we can ever shoot out our attention to any object of thought, independently of suggestion by the idea next preceding, is a question of much interest but not of great practical importance to the teacher. His chief reliance must be placed in the laws of association; and his great work, as an instructor, must consist in firmly establishing ideas in logical trains, or series, of such sort as will most serviceably insure the recovery of ideas when needed. To have had many ideas on a subject is not of much use unless they can be commanded when wanted.

APPLICATION 1.—"*Enrich your teaching with as many relevant associations as possible.*"—LAURIE.

That mental efficiency which follows the power of ready

recall is dependent upon breadth of association, the number and variety of relations established between the items of our knowledge. Says Halleck, "Bind new facts to other facts by relations of similarity, cause and effect, whole and part, or by any logical relation, and we shall find that when an idea occurs to us a host of related ideas will immediately flow into the mind."

The great importance to the learner of widely correlating all the facts for which he is likely to have any future use, of knitting together the different subjects studied, has already been discussed in Chapter XXXVII. As was then said, the student should always be asking himself, "Where have I ever met anything like this before? What have I already learned to which this fact, or principle, bears any relation?" This mental habit of continually striving to organize our knowledge and make the new acquisitions enrich the old ones instead of displacing them, is one of the utmost value. In no phase of teaching will the skill of the instructor, or his lack of it, be more manifest than in this work of securing breadth of association.

But it is not enough that facts should be somehow associated in our minds; we can hardly escape that by any means. The important matter is that they should be wisely and effectively associated; the associations should be *relevant*. We have already, in Chapter XVII, discussed the greater value of association by similarity and cause and effect. It is true that association by contiguity is a necessity in certain stages of our mental development. It is our main reliance in certain mechanical operations, as learning to spell, learning the multiplication table, and the like. Some facts in geography may also be best remembered by their contiguities, as the States of the Atlantic coast or the capes and bays of that, or any, coast

line. These must be visualized, as represented on the maps, and then held as parts of a visual whole.

But teacher and pupil should always be on the watch for more vital relations, for the similarities which are the basis of classification and the casual relations which furnish the rational connection of all phenomena. It is this thread of cause and effect which alone can make the physical world or human history intelligible, in the first place, and rememberable, in the second place. So the demand for the discernment of resemblances and causal connections should be persistent in all instruction. What for? What like? and What of it? are questions which should slip from the teacher's tongue, not mechanically, but habitually and intelligently.

APPLICATION 2.—"*In teaching, repeat and re-repeat, revise and re-revise, and be always falling back on elementary facts and principles, relative to the subject of instruction, so as to maintain the series of associations.*"

—LAURIE.

What is here enjoined is not mere mechanical repetition, whose purpose is to deepen and keep clear the paths of nervous discharge, but that sort of repetition and review which brings ideas into the mind in new relations, thus revealing new force and value in the ideas recalled. For instance, one who recalls his knowledge of the force of gravity in connection with the flight of balloons and sees it as the cause of that flight, has enriched his idea of gravitation and strengthened his hold upon it by knowing it in a new relation.

Here we find light on the matter of reviews, an argument for their greater use, and guidance as to their character. The most fruitful review is not a mere repetition of what has once been gone over, in the original order, but a consideration of additional facts which involve the

same causes, or principles, working under new conditions. As Laurie says, "Be always falling back on elementary facts and principles."

The pupil is naturally inclined to center his whole attention on the present day's lesson and drop out of sight that which he has once passed over; and too many teachers have the same habit, which is really a form of mental indolence. The teacher should give the pupil no peace and no discharge from that which he has once learned, if it was worth learning at all. He should be continually driven back to bring forward the earlier acquisition and see its bearing on the later. That reference to what has preceded which is so inexorable a necessity in the study of geometry, for instance, ought to be, to a considerable extent, the law of procedure in all studies. Says Holman (Education, p. 117), "How necessary it is to get the memory to do its work thoroughly will be recognized when we reflect that every new experience owes much, if not most, of its meaning and value to the action of the knowledge gained from former experience. That is, the worth of a presentation depends largely upon the work of representations." But the fullness and force of the representations will depend almost wholly on the character and firmness of the associations formed when they were first acquired or on occasion of their later recall.

CHAPTER XL

IMAGINATION

Principle X.—*Sense experience, though fundamental, is necessarily narrow and has relatively little value until taken up and recast by the cognitive imagination, which gives our knowledge its widest extension.*

Under Principle VIII, we emphasized the fundamental and necessary character of sense experience; here, we take up the complementary principle. Sense experience has not great value in itself, but in the use which can be made of it. It is necessarily narrow, because our movements are restricted and our immediate contact with the world as a whole is narrow. Even the most widely traveled have sensed but little of the knowable universe. It is only when we "take the wings of the morning" that we may "dwell in the uttermost parts of the sea." And to the untraveled, unread person, the world is very narrow indeed. It is related of some Tennessee mountaineers who were summoned to the county seat, fourteen miles away over the mountain, that on their return home they wondered among themselves whether the world was as big the other way as it was the way they had gone.

Application 1.—"*Imagination is the spiritual power to which all instruction turns, and upon whose coöperation the success of all instruction depends. The pupil apprehends the words of instruction only when his imagination succeeds in illustrating them by corresponding images.*"

—Lindner.

Says Tyndall, "Philosophers may be right in affirming that we cannot transcend experience; but we can, at all events, carry it a long way from its origin. . . . Newton's passage from a falling apple to a falling moon was, at the outset, a leap of the imagination." It is true that "imagination is always tied to the stake of perception by a cord of greater or less length"; but we should at least stretch the cord and make it as long as possible.

But the first and fundamental service of imagination does not involve wide or lofty flights. It consists simply in forming the appropriate images, sometimes very familiar, which the words of instruction represent and are meant to excite. The power which children acquire in school, under poor teaching, of reading and reciting words as mere visible and audible forms, without any associated images, would doubtless dishearten us if we were conscious of its full extent.

There are certain studies, of course, in which the office of imagination is greater than in others; though none are independent of it. No one has the right to teach history, for instance, who has not himself a lively power of imagination and the ability to arouse the imaginations of his pupils. No accumulation of dry fact, and no amount of the "philosophy" of history can take the place of a vivid imagining of events, characters, and personal relations. What profit in talking about the Aryan migrations, for example, if we mentally picture no Aryans, no exodus, no march, and no arrival?

Application 2.—*Imagination is the great instrument by which we "proceed from the known to the unknown"; it must therefore be brought into play in all fruitful acquisition.*

If I give to my pupil in geography any clear or serviceable idea of bungalows, igloos, or Doric temples; of

glaciers, jungles, whale-fishing, or mines, it must be through the stimulation and direction of his image-making power; and images there must be. Nothing can serve in their stead. Even more, when I pass to teach him of the social relations of mankind, of commerce and its necessary conditions, of transportation and mechanical inventions, of religious rites, and race migrations, must imagination be worked at its highest power or the results will be lifeless and fruitless, dead and dry as dust.

But nowhere more than in the Reading Class is this free play of imagination essential. Let it be, for example, a class in the Fourth Reader, and let the selection be either narrative, descriptive, or poetic, the constant demand of the teacher should be for imaging. "What do you see here as you read? How does it look? How do you picture that?" If suitable and adequate images are evoked, appropriate emotions will also arise, and true expression, that despair of teachers, will easily follow. The trouble is that teachers take too much for granted; it does not occur to them that the child's mind is not working like their own, and that his images may be far wide of the fact and leading him into unsuspected confusion of thought and fancy. And let it not be thought that this demand for definite images will prove wearisome to the child. Far from it, for it will all, if wisely and freshly handled, tend toward the *sine qua non* of learning, genuine interest in the content of the lesson.

CHAPTER XLI

ABSTRACTION AND GENERALIZATION

Principle XI.—*Abstraction and generalization are the fundamental elements in all thinking; without them there can be no general knowledge, no science. They are the basis of all classification and all definition; but, like imagination, they depend on experience for their data. The advance to rich conception is through clear and accurate perception.*

In imagination, we pass from the known to the unknown, but remain still in the realm of the particular. We imagine individual mountains, landscapes, or shipwrecks. If imagination can be thought of as representing relations it must be particular relations, between particular objects. But conception with its twin processes of abstraction and generalization carries us a long step higher, into the realm of rational thought, which marks the primacy of man over the brute, and which makes the rise of man from his savage state possible. Says Holman, "Out of abstract ideas arise all our science and philosophies. From pure thought-elements of experience we derive other and higher thoughts and build these into systems of thought. These are the highest, and purely rational, values of our experience, and can only come directly from that which is wholly mental. Ideas [concepts] are themselves the most general elements of knowledge, for they have an infinite applicability. An infinite number of things have size, shape, weight, and so on. Sciences and philosophies involve the most generalized forms of ideas."

The formation of clear, accurate concepts and judgments is the highest function of the intellect. And since our concepts and judgments are used over and over again in forming new ones, and in constructing systems of thought, the training of the mind to clearness and soundness in their formation is the end toward which the best efforts of the educator must always be directed. This proposition is not in conflict with the ideal of character as the chief end of education, for character itself demands right moral concepts and judgments.

APPLICATION 1.—"*It is a chief business of education to pass from distinctly perceived individual notions to clear general notions.*"—PESTALOZZI.

The most important step upward in the development of the mind's activity is that from perception to conception. This step can never be made short; there is no easy road to right thinking. Therefore, at this point the teacher needs great skill and the pupil great patience. Here the teacher is brought to the supreme test, and his own power of clear thought and mastery of scientific method, or lack of these, is revealed in his results.

The most difficult of the steps in conception, and so in all thinking, is that of abstraction, the clear determination of the essential qualities of the class, or species. That is why the construction of accurate, logical definitions is the most difficult of all mental undertakings. One needs only to observe the looseness with which people who think themselves intelligent apply such words as *lily*, *pine*, *insect*, *love*, *hate*, etc., to say nothing of the maudlin abuse of the adjectives *lovely*, *awful*, and the like, to realize that abstraction is a process so laborious as to be very generally shirked.

Of course, much of this slovenliness is due to pure indolence and indifference to accuracy, or truth; but

much of it, again, is due to defects of education, to loose and slovenly teaching in school days. Certain subjects in the school course, and notably formal grammar, are calculated, when properly taught, to discipline the power of abstraction. Grammar is especially a *conception-training study*, if consciously used to that end. The same should be true of the natural sciences, with their precise terminology. But no study will of itself, in spite of poor teaching, produce the desired discipline.

APPLICATION 2.—*The complete method of instruction is inductive-deductive; it involves not only the ascent from the particular to the general, but also a return from the general to particulars.*

Again and again, in our study of the mind and its processes, it has been impressed upon us that the foundations of all our thinking are laid in the concrete, in observation and comparison of individual things, acts, and events. The experience of every teacher should convince him of the futility of attempting to handle abstract notions and generalizations which have not been worked up to by the inductive method. The slough of despond, or mental obfuscation, in which the schoolboy is landed by the all too common practice of beginning with half-comprehended definitions and general rules is filled with struggling or stupefied victims of mistaken teaching, victims of the effort to make the child begin where the scientist left off.

But it would also be a serious error if the teacher's effort were confined to the objective-analytic-inductive procedure. That only will furnish the necessary materials for clear thinking, but we must not stop there. It is not enough to attain the clear concepts and accurate definitions; the concepts must be turned to use in judgment and the definitions must be logically applied. One of the

most discouraging experiences of any school examiner or teacher in the higher grades of work, is found in the bemuddled use of definitions by pupils, the exasperating inability to apply them accurately when need arises. And this is, perhaps, most forcibly exhibited in connection with grammar, that study which of all others, as elementary logic, ought to furnish profitable discipline in the forming and use of definitions.

This comes of the common "parroting" of rules and definitions, the substitution of words for ideas, which follows the premature use of the subjective-synthetic-deductive procedure. It is also, in part, a result of lack of rigor on the teacher's part in the enforcing of sufficient practice in the application of definitions, when the time has come for their use. The "return from the general to the particular," the deductive process in general, is in effect simply the application of generalizations to the multitude and variety of particular cases which are more or less covertly included under them. And this putting of individuals under concepts, of facts under principles, is, in its deepest significance, the finding of the reason for those facts. It is the method of explanation.

When the proper point has been reached for the learning of a definition, the step should be treated as a serious one. The language of the definition should be considered carefully; in every reproduction of it, absolute verbal accuracy should be insisted on—no looseness allowed. And then the definition should be *used*, not merely memorized; it should be made a familiar standard of reference and appeal.

CHAPTER XLII

DESCRIPTION AND EXPLANATION

Description and Definition.—This chapter may be considered as supplementary to the preceding one. We have already, in Chapter XXI, briefly touched upon the difference between description and definition. Description takes account of individuals only, and sets forth their more impressive aspects. Definitions pertain to concepts and set forth only those attributes which abstraction has selected as the basis of the species, and therefore common to all its members. Description thus deals with the concrete; definition is abstract. Description may be fragmentary; it may set forth only *some* of the characteristics and relations of the thing described, at the pleasure of the describer. Definition, to be valid, must set forth *all* and *only* the essential characteristics. Description holds good, so far as it holds at all, for only the one individual; definition holds for all the individuals of the class. Description implies perception or, possibly, imagination; definition implies abstraction and generalization, concepts.

Description and Explanation.—We have now to consider a third process, or activity, clearly distinguishable in its purpose from either description or definition, yet not always as clearly discriminated from them by teachers, even, as the interests of right thinking demand. Explanation and description are in no sense the same. Definition may be thought of as generalized description; explanation is not description at all, though it may, like description, relate to individual facts or events.

Description is concerned with the *what* and *how;* it tells *how* things look, sound, act. This, to be sure, involves a recognition of relations; but they are always particular relations. Explanation concerns itself only with the *why*. It is always a setting-forth of causes and requires a comprehension of laws, or principles. It deals with relations, but only with general, or logical, relations.

Says Prof. Lloyd Morgan, "It is of great importance that the teacher should clearly grasp the distinction between description and explanation, and should realize the fact of the invariably general nature of true explanation. It is one of the distinguishing features of good method in exposition that description should be kept apart from explanation. Many people use the two words without discrimination. They say, 'Let me explain to you where the book may be found in the library'; or, 'I will explain how you are to do such and such a thing.' Or they say, 'We will now describe why it is that a stone falls to the ground'; or, 'Describe how it is that a balloon rises in the air.' "

A similar and familiar misuse of terms is seen in those teachers of arithmetic and algebra who require pupils to work problems on the blackboard and then call upon them to "explain" their work. It is very seldom that any explanation is given. The pupil simply tells what he has done, or how, with no attention whatever to the reasons why; and the teacher calmly accepts his unconscious subterfuge, being apparently as ignorant as the pupil of the true nature of explanation.

Explanation Further Characterized.—Description and explanation both presuppose analysis; but explanation requires that form of analysis called abstraction, and adds to it generalization, which is a synthetic act. Whatever explains one fact must also explain all like facts.

Explanation is the reference of the individual to the general, to law, or principle. It is therefore "deductive" in its nature, and belongs to that return from the general to the particular which was discussed in our last lesson. It is "synthetic," because it puts particular cases under the general rule. Description, on the other hand, is "objective" and "inductive" in its nature.

To quote again from Lloyd Morgan, "It is obvious that adequate description should always be made the precursor to explanation. Not to do so is to proceed on the method, not of education, but of cramming. The explanation must never be allowed to be a mere statement committed to memory, and remembered, if remembered at all, through the association by contiguity of its constituent parts. One of the commonest faults in exposition is the putting forward of explanations before an adequate preparation in description has been systematically afforded."

Explanation, in short, involves reasoning of the deductive, or syllogistic, type; but as the syllogism derives its major premises from inductive reasoning, it follows that both modes are the necessary conditions of explanation. Explanation is always an appeal to principles, or truths, already known in their general form and in some of their applications. If the appeal is unsuccessful, then explanation fails.

CHAPTER XLIII

LANGUAGE

Principle XII.—"*Language is not merely the necessary instrument for the communication of thought; it is also an indispensable auxiliary to thought itself. Created by thought, it in turn develops it, aids it and defines it, and lightens the burden of intelligence.*"—COMPAYRÉ.

The central thought of the above pertinent quotation from the distinguished French educator, Compayré, has already been urged and amplified in Chapter XXIV. The first office of language is to think in. Thought becomes definite only through expression; and the great medium of expression is language. What one clearly knows he can always tell, for he does not clearly know it until he can tell. Ideas find their definite form and body in words, which, as we have said, are not the mere vestments, but the living integument of words.

But words are also the indispensable means of communicating thought, of exciting thought in other minds. As Dr. Carpenter puts it, "Language is an appeal to the ideational consciousness of another." Nothing absolutely new can be put into the mind of another by means of words; they serve, in communication, only to excite the mind to construct new images from the material already on hand. It is in this sense that language is an appeal. If the necessary materials are not in the possession of the mind addressed, the appeal must fail. If, on the other hand, the thought of the speaker is not accurately

expressed; if, in other words, muddy, confused thinking finds its natural counterpart in a slovenly, inaccurate choice and use of words, then the appeal must fail through its own confusion and inadequacy.

He who reflectively and intelligently considers language in these two aspects, as both the vehicle and the body of thought, must reach the conclusion that no other study is so vitally related to the cultivation of the understanding as the study of language. The mind that is not trained in the subtleties of words may find concrete expression in valorous deeds or, mayhap, in mechanical invention; but it can never rise to the level of high and accurate thinking. It will always dwell in the material rather than the spiritual realm.

APPLICATION 1.—"*He who is intelligently analyzing language is analyzing the processes of thought, and is a logician without knowing it.*"—LAURIE.

The reader who would acquaint himself with an adequate exposition of the value of the study of language is referred to Dr. Laurie's meaty little book, "Lectures on Language and Linguistic Method." Here, let us give attention, more narrowly, to the thought above quoted. Just what is meant by "analyzing language"? Several things. We may first think of it as applied to the sentence as a unit. Sentential analysis, if properly carried on and kept free from excessive use of the mechanical crutches of "diagraming," is no more nor less than an exercise in logic. The very terms *subject*, *predicate*, *copula*, *attribute*, etc., are borrowed from logic, and name the elements of all thinking. It is for this very reason that they also name the elements of language. "By the analysis of language, then, we introduce the young intellect to the analysis of thinking in its whole range," to quote once more from the work above men-

tioned. Care needs to be taken, however, that the pupil is really analyzing thought, at every step, and not simply pigeon-holing words and phrases in some mechanical diagraming device, intended to relieve the pupil from the labor of thinking.

But even more fundamental and essential than the formal analysis of sentences is the analysis and critical study of individual words. The etymological study of words, known in schools as Word Analysis, is an exercise of the utmost practical value, tending not only to a clearer comprehension of the force of individual words, through an acquaintance with their life-history, but also to a critical habit in the choice of words. The writer of this, back in boyhood days, was made acquainted with Salem Town's pioneer book on Word Analysis; and to this day he esteems it a happy fate that put him thus early on the track which led to Dean Trench's "The Study of Words" and Crabb's "Synonyms." He is firmly of the opinion that the intellectual habit engendered by those books has been, life through, of greater practical value, and intellectual satisfaction as well, than any other line of study in equal amount, which he can name.

The value of the study of formal grammar, the science of language as distinguished from the art, has already been touched upon in previous lessons. The several reasons for its study may be concisely summarized as follows:

1. As an instrument of self-criticism, in writing and in oral discourse.

2. As a standard of appeal, in the teaching of language and linguistic criticism.

3. As a mental discipline, the cultivation of the power of abstraction and classification.

4. As elementary logic, for the light it throws on the laws of thought.

In connection with the last statement, it seems not amiss to commend unqualifiedly the movement discernible of late among the makers of text-books in English Grammar, in which the thought side of grammar is emphasized and the connection between logic and grammar recognized.

Application 2.—*Language is abstract and has consequent limitations, of which one of the most serious is the danger that words may become substitutes for ideas. Another danger lies in the liability of the teacher to deceive himself as to how well he is understood.*

Says Holman (Education, p. 316), "Words represent the content of concepts in their most abbreviated and condensed forms. They fix most clearly and permanently in mind the expression of ends, processes, and products of thought; and they tend to make ideas more vivid and definite. . . . At the same time, however, words often prove a serious stumbling-block to thought and communication. Since it would be practically impossible to have an entirely different word for every different concept, much less for all the various shades of difference in each of our concepts—for this would prove too great a burden for our memory—we have to use the same sign for several ideas, or things. . . . Great practical advantage is derived from this economy of language, but there is great danger of confusion and error if the inevitable ambiguity is not provided for."

In the same line, Sully remarks, "The fact that the child is hearing a highly developed language spoken about him, which embodies the finer distinctions of mature intelligence, must tend to bewilder his mind at first. He finds it hard to distinguish between closely related and overlapping words, 'healthy' and 'strong,' 'sensible' and 'clever,' and so forth." The teacher must therefore

constantly bear in mind the manifold liabilities to error, and apply to the pupil at every step the necessary tests for determining just what significance he is attaching to the terms used.

These limitations of language have been more fully dwelt upon in Chapter XXIV, to which the reader is requested to refer, and especially to the discussion of the danger that words may *displace* ideas. With this evil, as with physical ills, prevention is better than cure; and the chief means of prevention, the inductive procedure in teaching, has also been dwelt upon in Chapter XXVI.

A single supplementary thought may be added here. The secret of power in expression, of effectiveness in public address and in literature, lies largely in the choice of words. This happy, effective choice may be, to some extent, a sort of artistic gift, through quick appreciation of similitudes and the figurative force of words; but it is primarily a result of nice discrimination. Sentimental Tommy, lingering long for the precise word, even to the point of losing the prize, was on the way to a most valuable habit of mind. The teacher can do his "lad o' pairts" no greater intellectual service than to stimulate and direct, with all possible energy and patience, the power of clean-cut thinking involved in the nice and critical choice of words.

CHAPTER XLIV

THE LAW OF EXPRESSION

Principle XIII. — *A sensory stimulus or an idea is incomplete until its motor tendencies have found expression of some sort. This expression clarifies, intensifies, enriches, and makes concrete the original experience, giving it significance and permanence.*

"All consciousness is motor" is a dictum advanced by many recent psychologists. The truth which it aims concisely to express is simply that all stimulation of the brain, whether by external or internal stimuli, *tends*, with greater or less force, to produce some physical result involving more or less of muscular contraction. The emotion of anger normally results in set teeth and clenched fists, if not in overt action; fear, on the other hand, is more likely to find its expression through the leg muscles or the vocal chords. This motor tendency, however, though real, may be so slight as to escape ordinary observation. It may produce results, as in the case of blushing or internal qualms, in which the muscular activity is not exposed to observation. Again, while the tendency is strong, the overt muscular activity may be counteracted, or inhibited, by internal stimuli, as in the control of the countenance exercised by a person of culture and discipline.

With children, as yet *naïve* and undisciplined, the power of inhibition is weak and the habit not yet established. We see them, therefore, reacting with great freedom to all sorts of stimuli, victims of sensory impression.

They have not yet learned the art of concealment or of self-control. There can be no doubt, moreover, that the free, unconstrained expression which they give to all impulses and emotions tends greatly to increase the intensity and tone, whether of pleasure or pain, of those emotions. In much the same manner, the enthusiasm, or hilarity, of a crowd becomes more and more pronounced and transporting in proportion as free rein is given to its motor expression. Emotion unexpressed is an abortive sort of thing; and the case is not different with ideas.

The general principle is quite aptly stated by Laurie, when he says, "There seems to be a general law in the universe that impression completes itself in expression, and that the former is incomplete without the actuality of the latter." But this must be taken as referring to more than muscular reactions. Expression in language must be included as, perhaps, the most important of all responses to stimuli.

APPLICATION 1.—*The school must provide for adequate expression on the part of pupils, both in respect to time and variety. Expression through language, oral and written, is of the utmost importance, but is not sufficient of itself. Drawing, modeling, sewing, and other forms of manual training are necessary to give full scope to the child's love and need of expression.*

To discuss these propositions here is only to reiterate statements that have been already advanced in various other connections. The school must continually demand expression from the pupil of some sort. "Say something that I may know you," was the demand of the ancient philosopher, and it should be no less the demand of the modern teacher. The great defect of the lecture system prevalent in our universities lies in its very limited demand for reproduction on the part of the students.

The members of the class are, for the most part, passively recipient, with the result that they are very imperfectly recipient. Here, too, is the evil of the loquacious, top-heavy teacher who does all the talking himself, or the impatient teacher who cannot wait for the slow working of the pupil's reproductive faculty. Great wrong is done to pupils by both these types of teacher. Learning takes time, and no time can be more profitably employed than by the efforts of the pupil to clarify by expression the ideas which he is striving to assimilate and fix in mind. And nowhere so much as in a normal school is it vitally important that the pupil should be practiced in free oral expression. One who cannot talk cannot teach, and the prospective teacher must learn to talk freely and to the point. He must be able to talk effectively or to refrain from talking as the occasion requires.

But language is not the only form of expression for which opportunity should be provided. It has been said, with much force, that the mind has many avenues of impression, but that schools commonly recognize but one outlet of expression, language. Drawing, modeling, and the various forms of manual training should not be looked upon simply as arts, aiming to actualize certain material products, but as forms of expression, mental activities in fact, which, in the words of our principle, "give significance and permanence" to our receptive experience. "Learn to do by doing" is a maxim which, properly, has reference only to the acquisition of skill. Learn to *know* by doing, might also be adopted as a maxim of value. Many a teacher has been heard to say, "I never knew much about grammar, or arithmetic, until I had to teach it." What is the real meaning of such a confession except that his knowledge of the subject was made clear and firm by the necessity of expression?

APPLICATION 2.—"*When impressions are passive, that is, do not issue in action, they gradually issue in insensibility.*"—BISHOP BUTLER.

"*Seize the very first possible opportunity to act on every resolution you make, and on every emotional prompting which you may experience in the direction of the habits you aspire to gain.*"—PROF. JAMES.

The knowledge that does not evidence itself in some form of expression is a delusion; it is not real knowledge. In like manner, the feeling that does not issue in action is abortive, and will soon be no feeling. The child or man who says, "I am sorry," and does nothing to prove the reality of his sorrow, may keep up the affectation of sympathy, but will soon become incapable of genuine fellow-feeling. The wise teacher may do much by seizing suitable opportunities, as they offer, to lead his pupils into concrete expression of sympathy with the poor and the afflicted. The coöperation of all the pupils of a school in providing Christmas or Thanksgiving dinners for those who seldom taste a good dinner is a familiar example of such expression. The gathering of a contribution, however small, for famine sufferers in India or the victims of a conflagration is a step in the emotional and moral culture of those who participate in it.

The teacher will not forget, as the wise parent does not, that there is another and converse phase of this relation of expression to emotion. There are feelings which do not so much demand expression as repression or even suppression. Feelings which are allowed no form of motor expression must "issue in insensibility"; but this is only a negative result, and self-control should have its positive side as well. The attempt to starve out animal propensities and undesirable emotions by the methods of the hermit in the desert are inevitably barren of right

result. There is need of a full and fruitful emotional life; there can be no worthy character without it. Therefore, let there be always the strongest and wisest stimulation, encouragement, and guidance of the generous impulses into genuine practical expression in word and deed.

CHAPTER XLV

WILL

Principle XIV.—*Every state of the mind is a compound of knowing, feeling, and willing, and we name the state from its predominating element. When these are in proper balance, they reinforce each other; when either one is in excess, the other will suffer eclipse; but the development of a good will is the consummate result of true education.*

The mind is a unit and not an aggregation. There can be no volition without feeling, no emotion without cognition; there can be no cognition without some sort of feeling both before and after; and volition must always have the guidance of intellect as well as the stimulus of emotion. But, on the other hand, an excess of emotion tends to paralyze judgment or render it erratic, as in the case of a man under sudden fear. An excess of the intellectual element with corresponding deficiency of emotion makes the cold, immobile mind, whose impulses are always in a neutralizing balance, always finding as many reasons for inaction as for action. Again, the active, bustling temperament, always holding motor nerves "on the trigger," is constantly precipitated into ill-considered action through lack of intellectual balance and, it may also be, without those strong emotions which spring from penetrating insight or concentrated reflection.

The youth, therefore, of an emotional temperament needs to have his inhibitory powers strengthened by the deepening of his intellectual activities and interests. And him of the energetic, impulsive type we should aim to slow down by the same agency of intellectual discipline, that his activity may become more deliberative and

inspired by more far-reaching motives; while the one of cold, impassive nature, lymphatic or unsympathetic, needs most the quickening, contagious influence of hearty and warm-blooded companions and instructors. There is need, therefore, in every scheme, or system, for something more than a course of intellectual exercises, however incisive or logically arranged.

Meditation is often wise, profitable, and nourishing, even if not satisfying; but it is by no means the end of existence. Understanding is satisfying and also stimulating. But wise, fruitful, self-rewarding action is the ideal and perfect outcome of human life. This is at once the seed and the fruit of that character which is avouched to be the true end of education. A good will is simply a soul with strong altruistic emotions tempered by clear, well-balanced judgment so as to issue in effective and benevolent action, thus to yield the highest type of beauty and goodness.

Application.—*All the training and instruction of home, school, society, and the church should have for its aim the supplying of motives and inhibitions for the will or to give direct will training.*

It is the aim of every form of education, from that of savage tribes to the highest, to form the will according to some preconceived type, which type is an evolution and represents the social organization and ideals of the people. The higher these ideals, the more complex and difficult will be the educational processes. The lower forms consist mainly in the fixing with absolute firmness of certain habits, largely physical. In the higher forms of education, the habits to be formed will be principally habits of intellect, sensibility, and volition; and the number and variety needful is greatly increased by the increasing complexity of civilized life.

The tendency in the education of the past has been to lay disproportionate stress on certain intellectual processes and acquisitions, without sufficiently close examination of their value to the development of character and their consequent claims to prominence in educational procedure There has been a corresponding failure to recognize, in school training, the educational value of practical training, the exercise of judgment and skill in doing things and making things. Professor Dewey and others are calling our attention to our educational loss in the disappearance of the old-time home training which prevailed before the age of machinery and factory production. The student may read Dewey's "School and Society" with profit, for its suggestiveness. Whether the school can ever successfully provide any substitute for this form of will-training which belonged to a simpler mode of life and form of society, is a question which cannot be settled by the dictum of a philosopher, but is worthy of the most careful consideration. Unquestionably, manual training, when fully worked out and systematized, may do much for the training, not of "the eye and the hand" in the physical sense, but of the intellect and the will.

Furthermore, since education involves the whole man, the play instincts and social impulses must not be ignored or underestimated. The importance of school associations, of sports, school societies of all kinds, and the social side generally of school life, have by no means received, as yet, the studious attention which they deserve on the part of educators. There can be little question that school athletics, when once wisely organized and brought within the reach and interest of the whole student body, the puny as well as the strong, have educational possibilities and utilities as yet unrealized and unsuspected.

CHAPTER XLVI

FEELING AND EDUCATION

Principle XV.—*Since feelings supply the strongest motives to the will and largely determine thought as well as action, the formation of worthy character involves careful cultivation of the emotions, both in the way of stimulation and repression.*

Whether ideas can furnish motives to the will except through the medium of the feelings which they excite is a question for the psychologist to answer, if he can. The educator, meanwhile, must recognize feelings as the springs of action and must play upon them, in all their range, as the keyboard of conduct. But he must not be content to leave them as he finds them; the finest part of his work should consist in the cultivation of the child's emotional nature. And it is, no doubt, the most difficult part, calling for the greatest insight and skill. "How *can* I cultivate the emotions of children? How can I get hold of the emotional side of mind to in any way develop it?" are questions which have baffled many an earnest, thoughtful teacher. But to many who are trying to teach they have not occurred as conscious problems.

How *shall* we, then, address ourselves to the emotional natures of our pupils? Certainly not in any direct and overt way. We cannot, with any useful result, say to the child, "Now you ought to feel thus and so." We cannot set the sensibility specific tasks as we do the intellect.

We are unable to approach it in that way. Our educational approach to the mind is primarily through its cognitive powers. But, secondarily, we have access to the emotional nature through the sympathetic, or contagious, character of feeling. Here is something which is not rational but instinctive, a principle of suggestion lying deep in our nature which enables us to exert an influence otherwise impossible, an influence often unintentional and sometimes injurious, but potent nevertheless. And it is largely through this principle of suggestion, or contagion, that the educator must skillfully work, not blindly nor blunderingly.

APPLICATION 1.—"*The training of the moral faculty in a self-reliant mode of feeling and judging includes the habitual exercise of the sympathetic feelings together with the powers of judgment.*"—SULLY.

Two important truths combine in the above text. One is that thought and feeling should be exercised and cultivated together. The character and quality of feeling are determined in a great degree by the nature of the ideas which call them forth. The so-called intellectual and æsthetic feelings can only be stimulated in connection with the appropriate ideas and judgments And those compounds of thought and feeling which we call ideals, cannot be set up without the coöperation of the understanding.

The other thought is that our aim must be to make right and advantageous feeling habitual. If, for instance, I become a total abstainer, in later life it will be simply impossible for me to frequent, or even enter, a saloon. My early judgments on the dangers of bibulous indulgence have resulted in habits of feeling with reference to even the outward appurtenances of the liquor traffic which become protective, even though my ideas covering the

drinking of spirituous liquors may, meantime, have undergone considerable modification. But these habits of feeling have also resulted in habits of volition; the refusal of the will to enter saloons becomes itself, in a sense, automatic. When right choice becomes thus habitual, character is safely established and the end of education is, in so far, accomplished. But habit is the result of repetition, and the educator must see to it that occasion for right feeling and for the proper association of feeling and judgment are frequently and perseveringly provided.

APPLICATION 2.—*It is an important part of the teacher's work to supply motives. He therefore needs to become clearly acquainted with the whole gamut of incentives, their relative value and elevation.*

This work of supplying motives consists, we may say, in evoking right and vitalizing feelings in connection with the daily tasks of the school and the daily acts of the pupils, and in establishing the desired association between them. The character of these feelings and their rank in what we have called the *gamut* of motives have been briefly discussed in Chapter XXXIV (p. 243), to which the reader is again requested to refer.

A practical reflection may well be urged at this point, namely, that the teacher should never be content to secure a desired result by appeal to a lower motive than necessary. The child should be kept, so to speak, on moral tiptoe, though caution should be exercised lest he lose the needful contact between his feet and the ground. We must keep within the range of his possible and genuine emotional experience, and sedulously exclude all affectation or pretense. The pupil who cannot be reached by the highest motives must be met on his own plane, but his highest plane.

Application 3.—*The child's interests determine his effort and conduct, and through these the child can be most easily influenced, whether they are within or without his school life.*

We have defined interest as feeling, any form of feeling which arouses the effort of attention. A person is interested in any form of mental experience when it yields a pleasure which makes him desire more of it. A person's interests are those attachments which he forms for particular kinds of experience; in short, they are habitual feelings towards certain activities or phenomena. In accordance, therefore, with what we have been saying, under Application 1, the educator will strive to create profitable interests, to establish those habits of feeling which will result in the desired conduct. But all new interests must sprout out from old ones; the law of apperception holds here also. And thus it is important that the teacher should know what are the fundamental interests of his pupils, and get inside of them if possible. The teacher who can enter into any right interest of the child may thereby gain a starting point, a foothold of sympathy to influence that child to greater industry and better conduct.

CHAPTER XLVII

KNOWLEDGE AND EDUCATION

Principle XVI.—*The acquisition of knowledge is not the only, nor even the principal end of education; but there can be no education without it. "What blood and breath are to the body, that, in a larger sense, knowledge is to the mind; it is the means of mind nutrition."*

The word knowledge is sometimes used to denote the act, or process, of knowing. In common use, however, it signifies the product of that process, the sum, or store, of ideas and judgments acquired and retained. The body of knowledge, in this sense, varies greatly with individuals according to age, experience, and education. Is its amount a matter of vital moment, and if so, why? If mental power, or efficiency, and moral strength are the ends of education, is the acquisition of knowledge essential to their attainment?

When the writer was engaged in the supervision of schools, he took occasion to ask of the children in many schools the question, "Why do you go to school?" The almost invariable answer was, "To learn." To the next question, "Why do you wish to learn?" the majority could make no intelligent reply. And it is to be doubted whether their parents would have done much better. The relation of knowledge to education, and to life, is not very clearly conceived by people in general.

In generations not far remote, knowledge was thought to be an end in itself. The educated man was simply the

learned man, the scholar; and, since learning was not thought of as related either to power or to the utilities of life except in certain mysterious and questionable relations, as magic and astrology, it is not strange that the scholar was not held in high honor or regard. Scholarship was only pedantry. The modern scholar and scientist had not yet arrived. But the old scholastic view of knowledge has nearly disappeared. What is the true conception which should take its place, and what is the real relation of knowledge, or learning, to education? Why should the children strive to learn?

The Modern Conception of the Uses of Knowledge.—Since the school is for life, we may consider the uses of knowledge broadly, as related to the whole of life. It is clear to any one that knowledge, of the right sort, is useful for *guidance.* The engineer must have wide knowledge of the laws of physics, the properties of matter and the principles of mechanics, or fail utterly in his undertakings. The farmer must have knowledge of soils, of the requirements of plant life, of market demands; and so on through all the practical affairs of life. It is not so clearly recognized as it should be, however, that knowledge is equally necessary to the moral and spiritual life. One may be innocent and yet not be virtuous. No man can lead a right life without first knowing what *is* right, the bearings of actions, and one's relation to all his kind, The question which most troubles the well-intentioned man is, "What ought I to do; what is the true line of duty under these circumstances?" For instance, what is the right course of action with reference to the feeding of tramps? Social science yet lacks the needful knowledge for determining the final answer to that question. This value of knowledge for guidance in practical, scientific, and ethical directions is so great that, quite naturally,

many stop with that, and demand that education shall magnify this one end. And, even then, they ask only for the knowledge which shall tell us how to do things rather than that which can tell us what is worth doing.

Another conception of knowledge finds its greatest value not in the possession, but in the acquisition. In this view, what the mind most needs is judicious exercise. Mental tension is the prime condition of increase in power. It is the work which counts rather than the direct result of the work. There is unquestionably much truth in this conception; an important use of knowledge is for the *mental discipline* which its acquisition affords and even necessitates. Of this we shall have more to say later on.

A third value consists in the subjective satisfaction which the possession of knowledge yields. The mere joy of understanding, of knowing why things are as they are, how they came to be what they are—in short, the love of truth for its intrinsic rather than its practical value—is to most minds a sufficient reason for the pursuit of knowledge. In fact, this motive rivals, if it does not surpass, the practical interest as a stimulus to scientific investigation and abstract thinking. "I want to know" expresses alike the attitude of childish curiosity, suffering pain through its sheer ignorance, and that of the scientist or philosopher, deeply discontented with his relative ignorance as his mental horizon gradually widens. Along with this satisfaction in the possession of knowledge as such, may be reckoned that gratifying sense of power which accompanies its possession. "I know" means much the same as "I can."

Finally, a distinct use of knowledge may be found, in its elevating and refining influence. This result is, doubtless, what we should mean when we talk about the culture value of knowledge. It is, in a degree, the

æsthetic aspect of knowledge. But, in many minds, the culture value of knowledge includes also that satisfaction in its mere possession which was touched upon in the preceding paragraph. In either sense, what we call culture adds pleasure, refinement, and dignity to life.

Dr. W. H. Payne (Contributions to the Science of Education) lays stress upon the conception of knowledge as *aliment* for the mind. In discussing the law of mental growth through self-activity, he says: "There must be a supply of something in the nature of aliment that can employ these activities and sustain this growth. In other words, there must be something on which the organism can react in such a way that growth may take place through a process of elaboration and assimilation. The most general name for this aliment is knowledge." Another statement which he quotes is this: "Knowledge is the food of the mind. In order that food may strengthen the body, it must be duly digested and assimilated. And so knowledge must be not merely grasped, in its rudiments, by the indiscriminating memory, but it must be comprehended and, so to speak, digested, in order that it may nourish the mind." It may be that the physiological analogy is pressed too closely in this view; but there seems to be pedagogical value in this conception of knowledge as the nourishment of the mind.

Dr. Payne's summing up of the values of knowledge is given in the following scheme, viz.:

$$\text{Education Values.}\begin{cases}1.\ \text{Practical}\begin{cases}\text{Direct.}\\ \text{Indirect.}\end{cases}\\ 2.\ \text{Disciplinary}\begin{cases}\text{Specific.}\\ \text{Tonic.}\end{cases}\\ 3.\ \text{Culture.}\end{cases}$$

But we have here only opened up the consideration of education values, a subject which demands the studious consideration of every one who aims to exercise any influ-

ence in directing the course of education. The subject may be profitably pursued by the study of chapters in Bain's "Science of Education," Spencer's "Education," Payne's "Contributions," above cited, and McMurry's "General Method." Certain papers by Dr. Wm. T. Harris should be carefully digested, as "The Necessity for Five Coördinate Groups of Studies in the Schools," in the *Educational Review*, April, 1896.

APPLICATION 1.—"*Appropriate matter for investigation and study, properly presented to the mind, excites the necessary exercise, self-activity.*"—PROF. PUTNAM.

Here we emphasize, in a way, the disciplinary office of knowledge as (1) stimulating to activity, and (2) furnishing the "appropriate resistance," on which we touched in Chapter XXXIV (Self-Activity). But certain kinds of knowledge are believed to have especial adaptation to this disciplinary result, the development of mental efficiency by exercise. Many studies which seem to have little value for guidance in life or for culture in the narrow sense have been given prominence in the traditional courses of study, especially college courses, because of their supposedly great disciplinary virtue. It has been thought, indeed, that the disciplinary value of studies, generally, is in inverse ratio to their practical or information value.

Herbert Spencer was perhaps the first to openly challenge this view, by his declaration that the knowledge which is best for one end is also best for the other. "We may be quite sure," he says, "that the acquirement of those classes of facts which are most useful for regulating conduct involves a mental exercise best fitted for strengthening the faculties. It would be utterly contrary to the beautiful economy of Nature if one kind of culture were needed for the gaining of information and another

kind were needed as a mental gymnastic," a declaration which savors more of assumption than of argument.

But, while this position cannot be accepted unquestioningly, there has been a considerable reaction in recent years against the giving of great prominence to studies on purely disciplinary grounds. On this, the reader is referred to Dr. Hinsdale's paper on "The Dogma of Formal Discipline," in the *Educational Review* for September, 1894. The popularity of the Herbartian doctrines, of late, has resulted in the exalting of those studies having great "content value," as history and literature, to the comparative neglect of the more purely disciplinary studies. This reaction is, no doubt, wholesome, within limits; but we should be careful to remember, after all, that, whatever studies we employ, an important purpose is the exercise of the mind in overcoming difficulties. And while studies are not to be recommended solely because of their difficulty, still less are they to be chosen because of their lack of difficulty. The college boy hunting for a "snap" is only trying to cheat himself; and the worst fool is one who fools himself.

APPLICATION 2. — *Teachable materials are far from being of equal value as mental nutriment to all pupils, or at all times to the same pupil. Each stage of advancement and each peculiar condition must be considered in estimating educational values, and a proper balance and variety of studies should be insisted upon during school days.*

Here we have the conception of knowledge as mental aliment, which may be considered as combining the disciplinary and the culture ideals. Knowledge is nourishing both in its acquisition and its possession. The more knowledge we possess the better are we qualified for the assimilation of more knowledge. But, under the law of apperception, in making our pedagogical prescription of

the mental pabulum most suitable and profitable in a given case, we must always take account of the present *status* of the pupil both as to his mental constitution and his past treatment, whether successful or unsuccessful. Of course, under our methods of school organization, there is a practical difficulty in prescribing the best scholastic diet for each individual pupil; but the principle remains true, and the teacher should not fall into the error of believing that a fixed and invariable curriculum is best for all pupils. But this is by no means saying that we should always follow the lead of the pupil's inclination or caprice.

APPLICATION 3.—*The determination of what knowledge shall be presented to the mind for assimilation at a given time, or lesson, must not be left in any degree to chance or accident, but should be regulated by definite principles of procedure.*

There is first, of course, the necessity for a general outline, or course of study, which shall provide for a proper balance of mental activities, so as to exercise the mind on all its sides and also observe the logical sequence and dependence of studies. This will save the pupil from one-sided development, on the one hand, and prevent his being put by an unwise teacher at mental undertakings for which he has no adequate preparation.

But even more important, in the case of the rank-and-file teacher, is the more minute division and assignment of work which he must make from day to day. In short, the daily lesson plan is an essential item in the teacher's work. This involves, on his part, the presence of several conditions. First, there must be a consciousness of the general aim of each particular study, or branch—the reason why it should be taught at all. But, after and within this, there should be a distinct recognition of the

particular aim of the given lesson, the reasons for teaching it and the definite result which should follow "What real harm would come if I should omit this lesson?" is a question which the teacher might profitably ask himself in each case. The fact that it occupies a place in the text-book is not necessarily a sufficient reason for teaching it rather than something else.

Thirdly, the teacher needs to see clearly just what mental steps or processes are necessary on the pupil's part before he can realize the definite result aimed at; otherwise both will be wandering in a mental wilderness. This is a logical necessity, and involves a clear and thorough knowledge on the part of the instructor of the subject to be taught, both in its wider and its narrower relations.

Fourthly, the teacher must have a definite apprehension of the pupil's mental status with reference to these steps, of what ones he has already taken; for this must determine what remains to be done. Perhaps no mistake on the part of the teacher is more common or more wasteful than that of trying to erect the structure of knowledge on treacherous foundations, striving to advance the pupil in neglect of the apperceptive principle and even of the logical sequences. What does the pupil actually know along this road? What foundations has he on which to build? How much can be safely assumed as unnecessary to be taught or retaught? These are questions which must continually be asked and answered by the successful teacher. He must in some way "take stock" of the pupil's mental possessions with reference to each new topic, or "lesson-whole," in the whole curriculum. And all undue haste, through assumption of preparation which does not in fact exist, is only an attempt to "make bricks without straw," to build abutments on the quicksands.

Finally, in order that knowledge may grow apace and truly nourish the mind which appropriates it, in order, in short, that real mental assimilation may take place, it must be administered not only under proper conditions, but by natural and therefore scientific methods. Method, as we have said in Chapter XXVI, is systematic procedure according to principles; it is the pursuit of art according to the laws of science. And in the art of teaching these principles are the laws of mind; they exist in the nature of things and cannot be ignored or evaded. Whatever the child really learns he must learn according to these laws. The teacher may greatly assist him in this process, or, through ignorance and awkwardness, may impede instead of further his progress. The "artificial production of stupidity in schools" is not wholly a figment of the imagination; and it happens, wherever it happens, through neglect of the principles which have been imperfectly presented in the foregoing pages.

CHAPTER XLVIII

*THE ART OF STUDY

Misapplied Energy.—Many young people in school fail of even ordinary success in their work from lack of energy. Either they do not possess it or they do not use it in study; they are either weak or lazy—or frivolous, which means both weak and lazy. For such pupils, no school can accomplish much; they are foreordained to failure, in life as well as in studies. But there is another and larger class who put forth abundant energy but still fail of satisfactory results because they misapply it; they do not know how to turn it to account, and so waste it. They are earnest and work hard enough—too hard sometimes—and yet fail of full success. They are often conscious of this and so worry, and do not get the pleasure out of study to which they are properly entitled. They suffer simply because they have never learned how to study. And this is the fault of their teachers.

Why should this be so? Why do not all teachers teach their pupils how to study, how to apply their minds to their work successfully? Chiefly, perhaps, because they do not know how themselves, or at least do not know how to direct others. There are no ready-made recipes for successful study, no formulæ which we can mechanically apply. We must fall back on principles.

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*This chapter comprises the substance of two talks made to the students of the Whitewater Normal School at "morning exercises." It is appended here as in harmony with the purposes of the preceding chapters and supplementary to them.

The Principle of Concentration.—The first great principle of study, then, is that of *Concentration.* In Physics, we learn "the law of impenetrability," that two bodies cannot occupy the same space at the same time. Now the law of concentration is simply the law of impenetrability applied to mental operations. The student should remember the following simple, self-evident propositions: (1) You cannot learn a lesson and do a lot of other things at the same time. You cannot be a student and a "flutter-budget" at the same time. To master a lesson, you must "bone down" and stay at it. Half an hour of mental concentration is better than an hour and a half of flitting, or mental sauntering. The worst and most common of all mistakes in study is that of dawdling. (2) You cannot get a lesson and entertain company at the same time. Study is never a social activity. You cannot study and talk at the same time; when you are talking you are *not* studying. The talkative roommate is an expensive nuisance. "Mind each your own business, and keep your tongues still" is one good practical rule, at least, for successful study. "May John and I study our lesson together?" is a request often heard in country schools, at least; and many a teacher has fallen into that pitfall. It seems a reasonable request until we consider that two boys *cannot* study together. Study is an individual affair; and "studying together" is only a plausible way of wasting time.

The Principle of Reflection.—A second principle of study is that of *Reflection.* It is not enough to bend one's gaze resolutely and continuously upon the book; one must *think.* It is not enough merely to see, or to say, the words of the lesson, no matter how often. The pupil must *think into* the words before him, must realize their full and exact force, must be able to *illustrate* their

meaning. This is the supreme test of one's understanding of a statement, the ability to illustrate its application. The need of concentration and of surroundings favorable to concentration is simply in order that we may think.

It may be useful to explain a little more specifically what is meant by thinking. As here applied to study, it means (1) Comprehending the meaning of abstract terms, what is technically called conception. In every branch of study, as grammar, arithmetic, or geography, there are many technical terms, belonging especially to that subject. These must all be clearly comprehended or they are like algebraic symbols of unknown quantities. We only juggle with them unless we can reduce them to terms of the known. Our use, or abuse, of definitions illustrates this matter pertinently; they are mere verbal formulæ, or lingoes, unless we think clearly the exact meaning of all their terms. And how often we hear from a pupil, when called upon to explain a term, the feeble answer, "I can't define it," a confession that he cannot, or does not *think* it. If we have thought clearly what a word really means, we *can* define it. And a ready-made, second-hand definition is of no value to us unless we can apply it, exemplify it. So the first thing to do with a lesson is to understand it, to know what it says, what its words mean. (2) Another phase of thinking is that called reasoning, the deriving of new judgments, or conclusions, as consequences, from previous ones. It is, in a sense, only turning to account what we already know by analyzing it to see what it really involves, or by putting together what we already know in order to know more. A familiar characteristic of the average student is his lack of ability, or disposition, to *use* what he already knows. He lacks the habit of "putting this and that together" to see their bearing on each other.

The Principle of Organization.—(3) But it is not enough, even, that the pupil understand the lesson; he must organize his knowledge, must analyze it so as to see what are the important parts, or points, and then hang the other matter about these. The third principle of study is, thus, that of *Organization*, the proper relating and association of facts.

There are two relations between facts, which, above all others, we need to be looking out for continually. The first is that of similarity, or common nature. The labor of study consists largely in the teaching of resemblances, not superficial but intrinsic similarity. With this goes, also, discrimination, the watch for essential differences. For example, in a study of our "Spanish War," in order to really understand it we must be able to classify it with like wars. But in order to classify it we must first discriminate it from all unlike wars.

The second vital relation is that of cause and effect. Any immediate fact can have little value or interest to me unless I recognize it, on the one hand, as an effect of a discoverable cause, and, on the other hand, as a cause of discoverable results. Study should involve a constant watch for this relation between the fact under consideration at any time and others already familiar. It is by these two principles of similarity, or common nature, and the causal tie that we organize our knowledge and give it vitality. Our whole mental acquisition should be like a spreading tree, of which each item of knowledge is a living, growing twig.

The Practical Conditions of Successful Study.—To turn from this somewhat theoretical discussion of the necessary elements of real study to the immediately practical side of the business, let us briefly touch upon some of the external conditions favoring such study and some of the

mistakes to which pupils are naturally prone. To the pupil who has not yet acquired the habits of close concentration and reflection, quiet surroundings are a necessary condition. All distractions from the immediate surroundings should be reduced to the minimum. The family living-room with its miscellaneous attractions is a most unsuitable environment. A disorderly, turbulent schoolroom is little better. But to the noises of the street and the usual movements of the school, the pupil must become habituated. The pupil who cannot concentrate attention in the presence of familiar, unavoidable distractions has not yet learned the first lesson in mental application.

Favorable conditions as to light, temperature, and bodily comfort should be secured as far as practicable, and considerable freedom as to bodily posture may be allowed; mental attitude is the vital thing, and the body should be dismissed from consciousness if possible. In the case of night study, it is of no small importance that the light should be of adequate power and properly placed. If possible, it should shine over the reader's shoulder, if not, it should be properly shaded. A study lamp without a suitable shade is an enormity. By day, an open window is the worst possible location for studious application, a very effective bid for mind-wandering.

A Common Mistake in Study.—Probably the worst of all evil practices connected with ostensible study is the time-honored one of trying to learn a lesson by simply reading it over and over as a whole. This, in my boyhood days, was the regulation way of "studying" a spelling lesson. Each repetition became more mechanical and less critical than the last, until the whole process became one of mere silent or audible mumbling. Such a way of learning a lesson is, when we think about it, a first-class

illustration of how *not* to do it. So far as reading a book-lesson is concerned, only two readings, as a rule, need be given, and these not to the lesson as a whole, but to the several paragraphs, or sub-topics, one by one. The first reading should be for *comprehension*, with no other purpose than to understand what is presented. This reading should be deliberate and analytic. The second reading should be with intent to organize the matter and fix it in mind. Any additional time should be devoted to the effort of reproduction, thinking through the matter without more than occasional reference to the book. Comprehend and learn thoroughly whatever is attempted, even though it be only part of the assignment. If the assignment was too lengthy, let the teacher find it out through your inability to compass the whole in a proper manner. As a rule, it is far better to master a part of the lesson assigned than to "skim" the whole of it.

A closing remark may be made concerning the use, or rather the making, of tabular outlines. As a means, or method, of clearly apprehending relations and organizing the knowledge under process of acquisition, such analysis of subject-matter is of the greatest value. In fact, it is in many cases indispensable. But it is much to be preferred that the student work out such outlines for himself. A ready-made tabulation, furnished by the text-book or the teacher, has comparatively little value except for review purposes; while one worked out by the student himself is a sure means to real comprehension, and a valuable aid to retention.

INDEX